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 Montgomery County, Indiana

How To Use This Soil Survey

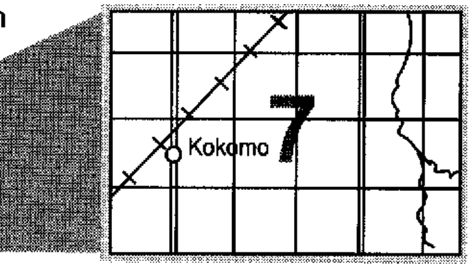
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

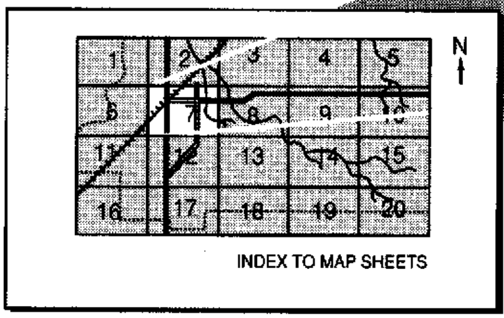
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



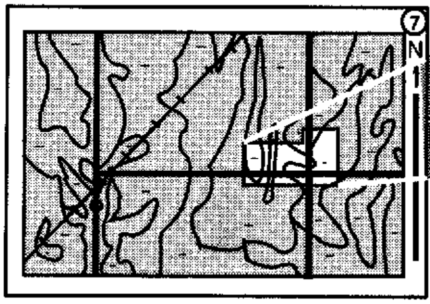
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

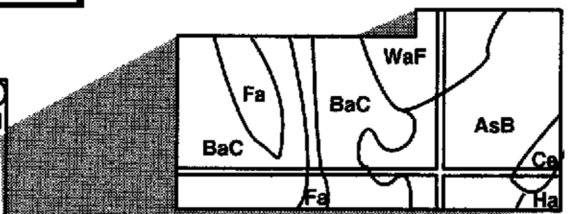


INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

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

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Montgomery County Soil and Water Conservation District. Financial assistance was made available by the Montgomery County Commissioners and approved by the Montgomery County Council.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: An area of the gently sloping Xenia and Birkbeck soils used for corn, the dominant crop grown in Montgomery County.

Contents

Soil Series

Issued August 1989

Index to Map Units

Summary of Tables

Foreword

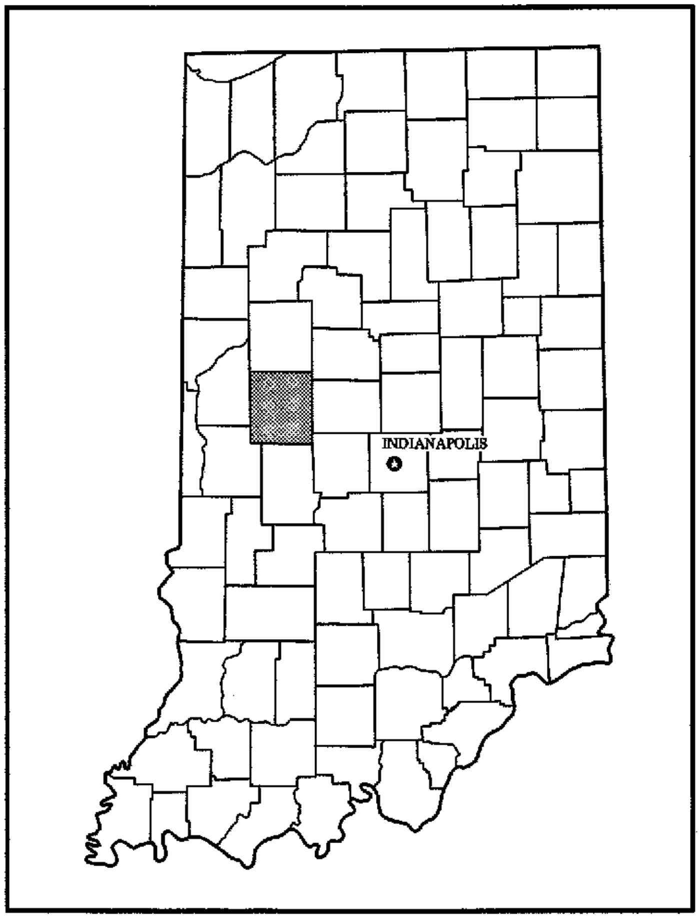
This soil survey contains information that can be used in land-planning programs in Montgomery County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and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



Location of Montgomery County in Indiana.

Soil Survey of Montgomery County, Indiana

By William D. Hosteter, Soil Conservation Service

Fieldwork by William D. Hosteter and George McElrath, Jr., Soil Conservation Service; Douglas R. Wolf, Indiana Department of Natural Resources, Soil and Water Conservation Committee; and Ray B. Bryant, Purdue University Agricultural Experiment Station

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

General Nature of the County

MONTGOMERY COUNTY is in the west-central part of Indiana. It has an area of 323,520 acres, or about 504 square miles. The population is about 35,501 (*7*). Crawfordsville is the county seat.

Most soils in Montgomery County are farmed. Corn and soybeans are the principal crops. Many hogs and cattle are raised on the farms. In much of the county, subsurface drains, surface drains, or both are needed. In the west central and southwestern parts and in small areas throughout the rest of the county, erosion is the main hazard.

This soil survey updates the survey of Montgomery County published in 1914 (*4*). It provides additional information and larger maps, which show the soils in greater detail.

Relief and Drainage

Montgomery County is mostly on a nearly level plain dissected by creeks, streams, and drainageways. All of the county is within the Wabash River watershed. The northeastern, south-central, and east-central parts are characterized by low relief and few changes in topography. The topography near Sugar Creek, in the southwest corner of the county, is characterized by abrupt elevation changes and by deep draws that cut into the more nearly level areas. The rest of the county is rolling, except for a few nearly level areas. Elevation ranges from 560 feet above sea level, in an area where Sugar Creek flows west into Parke County, to 930 feet, in an area near New Ross, in the southeast corner of the county.

Settlement

Wilma Shortz, chairperson of the Montgomery County Soil and Water Conservation District, helped prepare this section.

The survey area was once inhabited by the Miami and Shawnee Indians. The first white men in the area were French traders, who traveled along Sugar Creek in the early 1800's; American Ranger units patrolling the frontier during the War of 1812; and Catholic missionaries, who arrived in 1818, intending to convert the Indians. In October 1818, the United States signed the Treaty of St. Mary's, also called the "New Purchase," buying an area of central Indiana that included Montgomery County from the Miami, Potawatomi, and Delaware Indians.

In 1822, the Indiana Legislature voted to organize Montgomery County, effective March 1, 1823. The county was named in honor of General Richard Montgomery, a Revolutionary War hero. The county's original size was reduced in 1826, when the present boundaries were established. In 1823, the county had one township, also called Montgomery. In 1824, it was divided into Scott, Union, and Wayne Townships. Between 1825 and 1833, these were divided into 11 townships.

In 1823, the Federal Land Office was moved from Terre Haute to Crawfordsville. On December 24, 1824, it started to sell federal lands in the area. It continued in operation until March 1853. Land was sold in 80-acre tracts.

The first white settler in the county is believed to be William Offield, who built a log cabin 4 miles southwest of the present site of Crawfordsville in 1821. A marker stands on the spot. The first cabin on the site of Crawfordsville was built in the spring of 1822. Many of the early settlers came from Kentucky, Virginia, North Carolina, and Ohio. In addition to farming, they worked in the water-powered gristmills and sawmills along Sugar Creek or in coopering enterprises that made use of the good available timber.

Major Ambrose Whitlock laid out the town of Crawfordsville in March 1823. In that year, 61 citizens voted in the first county election, choosing three county commissioners. Wabash College was founded at Crawfordsville in 1832. The town was incorporated on October 14, 1934.

An 1830 census of Montgomery County reported a population of 7,313. The 1980 census reported one of 35,359. An 1840 census of Crawfordsville reported a population of 1,327. The 1980 census reported one of 13,301.

The first county railroad was completed in 1853. A railroad between Crawfordsville and Indianapolis was completed in 1869. Others were built following 1869.

In 1913, a special county agent was obtained through the Purdue University Extension Service. Montgomery County was the fourth county in the state to have such an agent. Between October 1922 and January 1939, there was no extension work done in the county.

In 1940, residents of Coal Creek Township petitioned for the organization of a conservation district. After a hearing and referendum, one was organized. At that time districts were organized in individual townships. Montgomery County became the sixth county in the state to have a conservation district. Beginning in 1944, other townships were added. By 1946, the entire county was included in the district. In that year, the name was changed to Montgomery County Soil Conservation District. In 1960, it was changed to Montgomery County Soil and Water Conservation District.

Transportation Facilities

Three federal highways cross Montgomery County. Interstate Highway 74 and U.S. Highway 136 cross the county from east to west. U.S. Highway 231 crosses the county from north to south. The county has several miles of state highways.

There are a few private airstrips in the county. A small municipal airport is south of Crawfordsville. Crawfordsville is served by two railroads. Most of the small towns are served by at least one railroad.

Water Supply

This section was adapted from a bulletin published in 1979 by the Indiana Department of Natural Resources (*3*).

Consolidated rocks of Mississippian age and glacial deposits of Pleistocene age are the major sources of ground water for livestock and for domestic, industrial, and municipal uses in Montgomery County. The rocks of Mississippian age form the bedrock surface in nearly all areas, except for a minor area in the extreme southwest corner of the county. These rocks are exposed along Sugar Creek and in scattered areas in the southern and eastern parts of the county. Siltstone and shale of Early Mississippian age are the predominant rock types, although limestone is of considerable extent in the eastern part of the county. Limestone of Late Mississippian age is evident only in the extreme southern part of the county. All these rock units are water bearing to varying degrees, and as a group they form one of the two major sources of ground water in the county.

The depth of wells in the siltstone and shale of Early Mississippian age ranges from 30 to 300 feet. The most common depth is about 75 feet. Yields range from less than 1 gallon to about 270 gallons per minute. Some holes are dry. The depth of wells in the limestone of Early Mississippian age ranges from 40 to 185 feet. The most common depth is about 65 feet. Yields range from less than 1 gallon to about 50 gallons per minute. Some holes are dry. The variation in depth of the wells drilled into rock results mainly from differences in the thickness of the glacial drift overlying the bedrock. The majority of the wells obtain water in the first 50 feet of rock.

Rocks of Pennsylvanian age are evident only in the extreme southwest corner of the county. They consist chiefly of sandstone and shale and are a minor source of water for livestock and for domestic uses. The depth of the wells drilled into these rocks ranges from about 80 to 120 feet.

Unconsolidated glacial deposits of Pleistocene age overlie the consolidated rocks in nearly all of the county. These deposits consist of till and glaciofluvial sand and gravel.

Preglacial streams eroded valleys in the bedrock surface in Montgomery County. The present valleys of Sugar, Cornstalk, Little Raccoon, Big Raccoon, and Black Creeks tend to follow some of these preglacial valleys. Other preglacial valleys have been completely filled and buried by glacial material.

Deposits of sand and gravel have been penetrated by wells drilled into the preglacial valleys. Few wells completely penetrate the sand and gravel. The deposits are as much as 80 feet thick and average about 20 feet. They may be underlain by bedrock, overlain by till or recent deposits, or interbedded within the till. They are not necessarily continuous. In some areas till completely fills a preglacial valley. The deposits of sand and gravel in nearly all areas of the preglacial valleys are overlain by till. In an area west of Crawfordsville, near the confluence of Sugar and Black Creeks, the sand and gravel are overlain by recent alluvium. In this area erosion has removed the till that once overlaid the sand and gravel.

Yields from the sand and gravel deposits range from 5 to 1,000 gallons per minute. The thickness of the saturated zone and the grain size of the material in the deposits can vary greatly within a short distance. These two factors control the potential yield.

Yields sufficient for livestock, for domestic uses, and possibly for use by small industries and municipalities are available from the sand and gravel deposits associated with the preglacial valleys. Yields sufficient for use by large industries and municipalities are available in the vicinity of Crawfordsville. They may be available from sand and gravel deposits associated with preglacial valleys in a small area in the southeastern part of the county.

Large amounts of glaciofluvial sand and gravel in the northern part of the county are not associated with preglacial valleys. The sand and gravel are interbedded in till as extensive sheetlike deposits 10 to 15 feet thick. Yields of as much as 20 gallons per minute, more than adequate for domestic and livestock supplies, have been reported from wells penetrating these deposits. In some areas yields are sufficient for use by small industries and municipalities.

A modal grouping was used to ascertain the most frequent values for the hardness of water and for the content of chloride and sulfite in the ground water in Montgomery County. This analysis indicates the following results for water from aquifers of Mississippian age: hardness, 324 ppm; chloride, 8 ppm; and sulfate, 14 ppm. The analysis indicates the following results for water from aquifers of Pleistocene age: hardness, 324 ppm; chloride, 8 ppm; and sulfate, 15 ppm.

Climate

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

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Crawfordsville 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 29 degrees F, and the average daily minimum temperature is 19 degrees. The lowest temperature on record, which occurred at Crawfordsville on December 22, 1963, is -22 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 15, 1954, is 106 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 about 40 inches. Of this, 24 inches, or 60 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 21 inches. The heaviest 1-day rainfall during the period of record was 5.7 inches at Crawfordsville on July 14, 1962. Thunderstorms occur on about 45 days each year. Tornadoes and severe thunderstorms strike occasionally. They usually are local in extent and of short duration and cause damage in scattered areas.

The average seasonal snowfall is 18.5 inches. The greatest snow depth at any one time during the period of record was 15 inches. On the average, 15 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.

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 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 coincide 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 associations.

Soil Descriptions

Nearly Level, Moderately Well Drained and Well Drained Soils on Flood Plains

These soils make up about 2 percent of the county. Most areas are used for cultivated crops. Some are used as pasture. The soils are only fairly well suited to cultivated crops because of a flooding hazard. They are well suited to woodland. They are poorly suited to sanitary facilities and building site development because of the flooding hazard.

1. Beckville-Stonelick Association

Nearly level, moderately well drained and well drained soils formed in alluvium; on flood plains

The soils in this association are along the larger streams, particularly Sugar Creek. The bottom land generally is narrow but in a few places is as much as 0.75 mile wide. Slopes range from 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 51 percent Beckville soils, 15 percent Stonelick soils, and 34 percent soils of minor extent.

Beckville soils are moderately well drained. They are mainly in swales between areas of higher lying, better drained soils. In many areas of narrow bottom land, however, they are the only soils mapped. Typically, the surface layer is very dark grayish brown loam. The underlying material is brown, mottled loam in the upper part and brown, dark grayish brown, and grayish brown loam and sandy loam in the lower part.

Stonelick soils are well drained and are on rises and natural levees near streams. Typically, the surface soil is dark brown silt loam. The underlying material is dark yellowish brown and brown fine sandy loam.

The soils of minor extent in this association are the somewhat poorly drained Ceresco soils in swales, the well drained Landes Variant soils on the higher flood plains along Sugar Creek, and the well drained Stonelick Variant soils on low flood plains adjacent to the streams.

About 70 percent of this association is used for corn or soybeans. Many of the wetter areas and the areas adjacent to the streams are used as pasture or woodland. Growing cash-grain crops and raising beef cattle are the main enterprises. The soils are well suited to cultivated crops. Flooding is the main management concern. It can damage crops in some years.

The soils in this association are well suited to trees. No major hazards or limitations affect planting or harvesting.

The soils in this association are generally unsuited to sanitary facilities and building site development because of the flooding hazard.

Nearly Level, Somewhat Poorly Drained to Very Poorly Drained Soils on Uplands

These soils make up about 50 percent of the county. During winter and spring, the water table commonly is within a depth of 3 feet and many areas are ponded. A drainage system is essential if crops are grown. Nearly all areas are drained to some extent. They are used for corn and soybeans. Wheat and hay also are grown. The soils are well suited to cultivated crops. They are fairly well suited to woodland. They are poorly suited to sanitary facilities and building site development because of the wetness.

2. Crosby-Treaty Association

Nearly level, somewhat poorly drained and very poorly drained soils formed in silty material and glacial drift; on uplands

The soils in this association are on broad till plains characterized by a swell and swale topography. Surface drainage is mostly through open ditches and small streams that empty into Big Raccoon Creek. Slopes range from 0 to 2 percent.

This association makes up about 4 percent of the county. It is about 50 percent Crosby soils, 31 percent Treaty soils, and 19 percent soils of minor extent (fig. 1).

Crosby soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of dark grayish brown silt loam and a subsoil of yellowish brown and grayish brown, mottled silty clay loam, clay loam, and loam.

Treaty soils are very poorly drained and are in swales and along drainageways. Typically, they have a surface soil of black silty clay loam and a subsoil of grayish brown and gray, mottled silty clay loam and loam.

The soils of minor extent in this association are the gently sloping Crosby soils on side slopes; the well drained, gently sloping to strongly sloping Miami soils on rises, side slopes, and breaks along drainageways; and the somewhat poorly drained Whitaker soils on slight rises. The Whitaker soils have a till substratum.

About 85 percent of this association is used for corn or soybeans. A small acreage is used for hay, pasture, woodland, or wheat. Much of the corn is fed to the many hogs that are raised in areas of this association. If drained, the soils are well suited to row crops, wheat, and hay. A drainage system of subsurface drains and open ditches has been established in most areas.

The soils in this association are well suited to trees. Only a few areas support highly desirable species. The wetness usually hinders logging in winter and early spring unless the ground is frozen.

The soils in this association are poorly suited to sanitary facilities and building site development because of the wetness.

3. Fincastle-Cyclone Association

Nearly level, somewhat poorly drained and poorly drained soils formed in silty material and glacial drift; on uplands

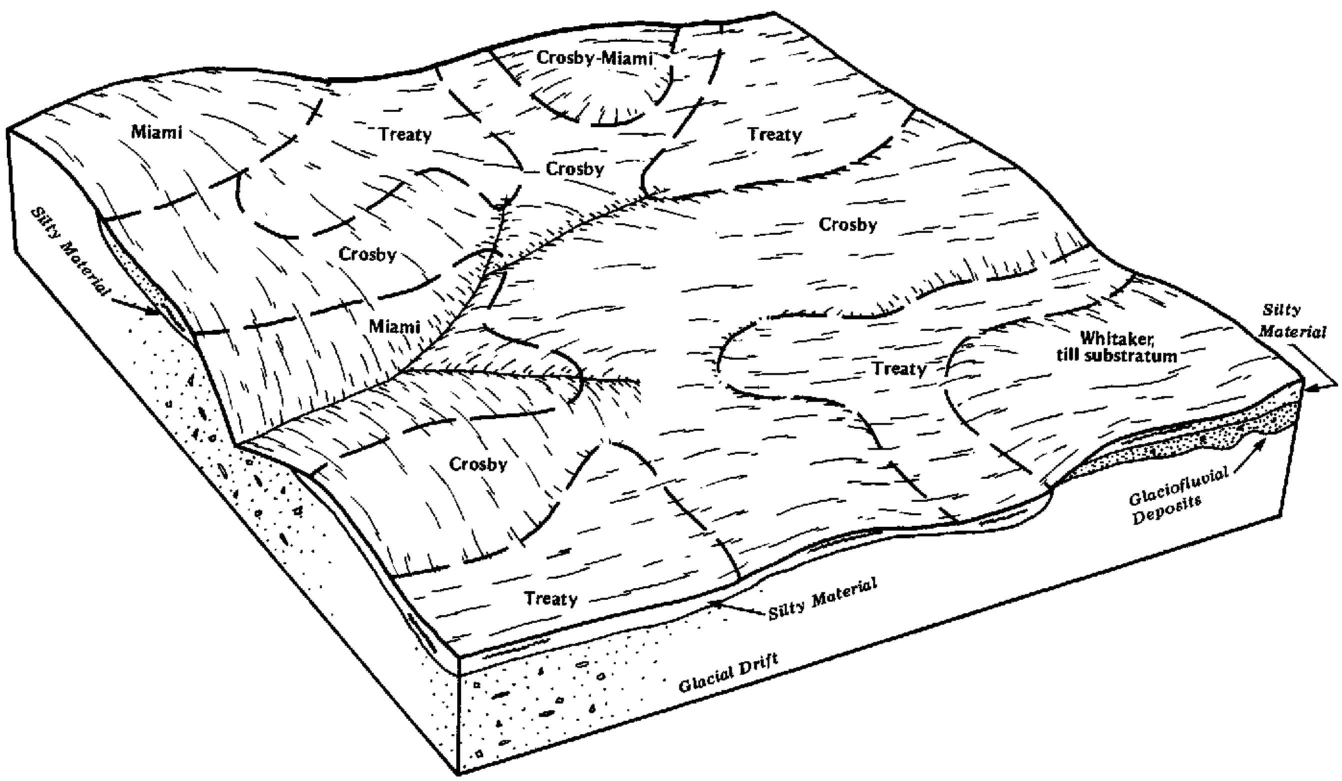


Figure 1.—Pattern of soils and parent material in the Crosby-Treaty association.

The soils in this association are on broad till plains characterized by a swell and swale topography. Surface drainage is mostly through open ditches that empty into Sugar Creek. Slopes range from 0 to 2 percent.

This association makes up about 9 percent of the county. It is about 46 percent Fincastle soils, 15 percent Cyclone soils, and 39 percent soils of minor extent.

Fincastle soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of dark brown silt loam; a subsurface layer of grayish brown, mottled silt loam; and a subsoil of yellowish brown, mottled silty clay loam and loam.

Cyclone soils are poorly drained and are in broad depressions, in swales, and along drainageways. Typically, they have a surface soil of black silty clay loam and a subsoil of dark gray, grayish brown, and yellowish brown, mottled silty clay loam, silt loam, and loam.

The soils of minor extent in this association are the somewhat poorly drained, gently sloping Fincastle soils on side slopes; the well drained Miami soils on knobs, ridges, and breaks along streams and drainageways; and the very poorly drained Cohoctah and Saranac soils on narrow flood plains.

About 90 percent of this association is used for corn or soybeans. A small acreage is used for wheat, hay, woodland, or pasture. Much of the corn is fed to the many hogs that are raised in areas of this association. The soils are well suited to row crops, wheat, and hay. A drainage system of subsurface drains and open ditches has been established in most areas.

The soils in this association are well suited to trees. Only a few areas support highly desirable species. The wetness usually hinders logging in winter and early spring unless the ground is frozen.

The soils in this association are poorly suited to sanitary facilities and building site development because of the wetness.

4. Reesville-Ragsdale-Fincastle Association

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

The soils in this association are on broad till plains characterized by a swell and swale topography. Surface drainage is mostly through open ditches that empty into Big Raccoon and Little Raccoon Creeks. Slopes range from 0 to 2 percent.

This association makes up about 14 percent of the county. It is about 55 percent Reesville soils, 18 percent Ragsdale soils, 15 percent Fincastle soils, and 12 percent soils of minor extent.

Reesville soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of dark grayish brown silt loam; a subsurface layer of light brownish gray, mottled silt loam; and a subsoil of grayish brown, yellowish brown, and light olive brown, mottled silty clay loam and silt loam.

Ragsdale soils are very poorly drained and are in broad depressions, in swales, and along drainageways. Typically, they have a surface layer of very dark grayish brown silty clay loam; a subsurface layer of very dark gray, mottled silty clay loam; and a subsoil of gray and light brownish gray, mottled silty clay loam and silt loam.

Fincastle soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of dark brown silt loam; a subsurface layer of grayish brown, mottled silt loam; and a subsoil of yellowish brown, mottled silty clay loam and loam.

The soils of minor extent in this association are the moderately well drained Birkbeck and Xenia soils on gently sloping rises and on breaks along drainageways and the somewhat poorly drained Shoals soils on narrow flood plains.

About 90 percent of this association is used for corn or soybeans. A small acreage is used for wheat, hay, woodland, or pasture. Much of the corn is fed to the many hogs that are raised in areas of this association. The soils are well suited to row crops, wheat, and hay. Wetness is the main management concern. A drainage system of subsurface drains and open ditches has been established in most areas.

The soils in this association are well suited to trees. Only a few areas support highly desirable species. The wetness usually hinders logging in winter and early spring unless the ground is frozen.

The soils in this association are poorly suited to sanitary facilities and building site development because of the wetness.

5. Starks-Mahalasville Association

Nearly level, somewhat poorly drained and very poorly drained soils formed in silty material and glaciofluvial deposits; on uplands

The soils in this association are on broad till plains characterized by a swell and swale topography. Surface drainage is mostly through open ditches and small streams that empty into Coal and Sugar Creeks. Slopes range from 0 to 2 percent.

This association makes up about 23 percent of the county. It is about 46 percent Starks soils, 35 percent Mahalasville soils, and 19 percent soils of minor extent.

Starks soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of dark grayish brown silt loam and a subsoil of yellowish brown, mottled silty clay loam and loam.

Mahalasville soils are very poorly drained and are in broad depressions, in swales, and along drainageways. Typically, they have a surface layer of very dark gray silty clay loam, a subsurface layer of black silty clay loam, and a subsoil of gray, grayish brown, and light brownish gray, mottled silty clay loam, silt loam, and loam.

The soils of minor extent in this association are the well drained Camden soils on rises and knolls, the somewhat poorly drained Crosby soils on rises, the poorly drained Cyclone soils in depressions and narrow drainageways, the very poorly drained Pella soils in broad depressions, the very poorly drained Milford soils in potholes, the very poorly drained Muskego soils in potholes and broad depressions, and the well drained Martinsville and Ockley soils on knobs and ridges. The Martinsville and Ockley soils have a till substratum.

About 85 percent of this association is used for corn or soybeans. A small acreage is used for wheat, hay, pasture, or woodland. Much of the corn is fed to the many hogs that are raised in areas of this association. The soils are suited to row crops, wheat, and hay. Wetness is the main management concern. A drainage system of subsurface drains and open ditches has been established in most areas. The soils in this association are suited to trees. Only a few areas support highly desirable species. The wetness usually hinders logging in winter and early spring unless the ground is frozen.

The soils in this association are poorly suited to sanitary facilities and building site development because of the wetness.

Nearly Level, Very Poorly Drained to Somewhat Poorly Drained Soils on Uplands, Outwash Plains, and Terraces

These soils make up about 12 percent of the county. During spring and winter, the water table commonly is within a depth of 3 feet and several areas are ponded. A drainage system is essential if crops are grown. Nearly all areas are drained to some extent. They are used for corn or soybeans. Wheat and hay are grown on a small acreage. The soils are well suited to cultivated crops and to woodland. They are poorly suited to sanitary facilities and building site development because of the ponding and the wetness.

6. Drummer-Raub-Brenton Association

Nearly level, poorly drained and somewhat poorly drained soils formed in silty material and glaciofluvial deposits or in silty material and loamy glacial drift; on uplands

The soils in this association are on broad till plains characterized by a swell and swale topography. Surface drainage is mostly through open ditches that empty into streams outside the association. Slopes range from 0 to 2 percent.

This association makes up about 8 percent of the county. It is about 41 percent Drummer soils, 20 percent Raub soils, 15 percent Brenton soils, and 24 percent soils of minor extent.

Drummer soils are poorly drained and are in broad depressions and in swales and drainageways. Typically, they have a surface layer of black silty clay loam, a subsurface layer of very dark gray silty clay loam, and a subsoil of gray, grayish brown, and yellowish brown, mottled silty clay loam and loam.

Raub soils are somewhat poorly drained and are on swells. Typically, they have a surface soil of very dark gray silt loam and a subsoil of dark grayish brown, dark yellowish brown, and yellowish brown, mottled silty clay loam and loam.

Brenton soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of very dark grayish brown silt loam and a subsoil of brown and yellowish brown, mottled silty clay loam, clay loam, and silt loam.

The soils of minor extent in this association are the well drained Jasper soils on knobs and ridgetops, the very poorly drained Milford soils in potholes, the well drained Octagon and Parr soils on knobs and breaks along drainageways, and the well drained and moderately well drained Proctor soils on rises and knobs. The Jasper soils have a till substratum.

About 95 percent of this association is used for corn or soybeans. A small acreage is used for wheat, hay, or pasture. Much of the corn is fed to the many hogs that are raised in areas of this association. The soils are well suited to row crops, wheat, and hay. Wetness is the main management concern. A drainage system of subsurface drains and open ditches has been established in most areas.

The soils in this association are well suited to trees. Only a few areas are wooded. The native vegetation was prairie grasses.

The soils in this association are poorly suited to sanitary facilities and building site development because of the wetness.

7. Mahalasville, Gravelly Substratum-Waynetown-Brenton Variant Association

Nearly level, very poorly drained and somewhat poorly drained soils formed in silty material and glacial outwash; on terraces and outwash plains

The soils in this association are on broad outwash plains characterized by a swell and swale topography. Surface drainage is mostly through open ditches that empty into Black and Coal Creeks. Slopes range from 0 to 2 percent.

This association makes up about 4 percent of the county. It is about 45 percent Mahalasville soils that have a gravelly substratum, 16 percent Waynetown soils, 12 percent Brenton Variant soils, and 27 percent soils of minor extent.

Mahalasville soils are very poorly drained and are in broad depressions and in swales. Typically, they have a surface layer of black silty clay loam and a subsoil of gray, grayish brown, and light brownish gray, mottled silty clay loam, loam, and silt loam.

Waynetown soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of dark brown silt loam; a subsurface layer of grayish brown, mottled silt loam; and a subsoil of yellowish brown, grayish brown, gray, and dark gray, mottled silty clay loam, loam, and gravelly sandy clay loam.

Brenton Variant soils are somewhat poorly drained and are on swells. Typically, they have a surface layer of very dark gray silt loam and a subsoil of brown, grayish brown, yellowish brown, and gray, mottled silt loam, silty clay loam, and gravelly fine sandy loam.

The soils of minor extent in this association are the moderately well drained Bowes Variant soils on slight rises, the well drained Ockley, Rush, and Waupecan soils on rises and breaks, and the moderately well drained Rush Variant soils on rises.

About 90 percent of this association is used for corn or soybeans. A small acreage is used for wheat, hay, woodland, or pasture. The soils are well suited to row crops, wheat, and hay. Wetness is the main management concern. A drainage system of subsurface drains and open ditches has been established in most areas.

The soils in this association are well suited to trees. Only a few areas support desirable species. The wetness usually hinders logging in winter and early spring unless the ground is frozen.

The soils in this association are poorly suited to sanitary facilities and building site development because of the wetness.

Nearly Level to Strongly Sloping, Somewhat Poorly Drained to Well Drained Soils on Uplands

These soils make up about 19 percent of the county. They generally are subject to erosion. The sloping, silty soils are very erosive. Some of the soils commonly have a water table at a depth of 1 to 4 feet in winter and early spring. The less sloping areas are used for corn or soybeans. The more sloping areas are used mainly for hay and pasture, but a few are used for corn or soybeans. A few areas are wooded. The soils are fairly well suited to cultivated crops and to woodland. They are poorly suited to sanitary facilities and are well suited to building site development.

8. Fincastle-Miami Association

Nearly level to strongly sloping, somewhat poorly drained and well drained soils formed in silty material and glacial drift; on uplands

The soils in this association are on till plains dissected by many drainageways and small streams. Ridges are between the drainageways in some areas. Some areas along the larger streams are characterized by steep, short breaks. Slopes range from 0 to 18 percent.

This association makes up about 5 percent of the county. It is about 58 percent Fincastle soils, 26 percent Miami soils, and 16 percent soils of minor extent.

The nearly level and gently sloping, somewhat poorly drained Fincastle soils are on rises, on ridgetops, and along drainageways. Typically, they have a surface layer of dark brown silt loam; a subsurface layer of grayish brown, mottled silt loam; and a subsoil of yellowish brown, mottled silty clay loam and loam.

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

The soils of minor extent in this association are the very poorly drained Milford soils in potholes and the very poorly drained Cohoctah soils on narrow bottom land.

About 90 percent of this association is used for corn or soybeans. Wheat also is grown. Some of the more rolling soils are used for hay and pasture. Raising beef cattle is an important enterprise. The Fincastle soils and the gently sloping Miami soils are well suited to row crops, wheat, and hay, but the moderately sloping and strongly sloping Miami soils are only fairly well suited or are poorly suited. Erosion is the main management concern if row crops are grown. A drainage system is needed in areas of the Fincastle soils.

The soils in this association are well suited to trees. No major hazards or limitations affect planting or harvesting.

The Fincastle soils are poorly suited to building site development and sanitary facilities because of wetness. The Miami soils are fairly well suited to building site development. They are poorly suited to sanitary facilities because of moderately slow permeability.

9. Xenia-Birkbeck Association

Moderately sloping and gently sloping, moderately well drained soils formed in loess and glacial till; on uplands

The soils in this association are on till plains dissected by drainageways and small streams. Some areas along the larger streams are characterized by steep, short breaks. Slopes range from 2 to 12 percent.

This association makes up about 9 percent of the county. It is about 38 percent Xenia soils, 27 percent Birkbeck soils, and 35 percent soils of minor extent (fig. 2).

The gently sloping and moderately sloping Xenia soils and the gently sloping Birkbeck soils are on rises and side slopes. The Xenia soils typically have a surface layer of yellowish brown silt loam and a subsoil of dark yellowish brown and yellowish brown, mottled silty clay loam and clay loam. The Birkbeck soils typically, have a surface layer of brown silt loam and a subsoil of yellowish brown silt loam and silty clay loam and yellowish brown, mottled silt loam and loam.

The soils of minor extent in this association are the somewhat poorly drained Fincastle and Reesville soils on nearly level ridgetops and in drainageways; the well

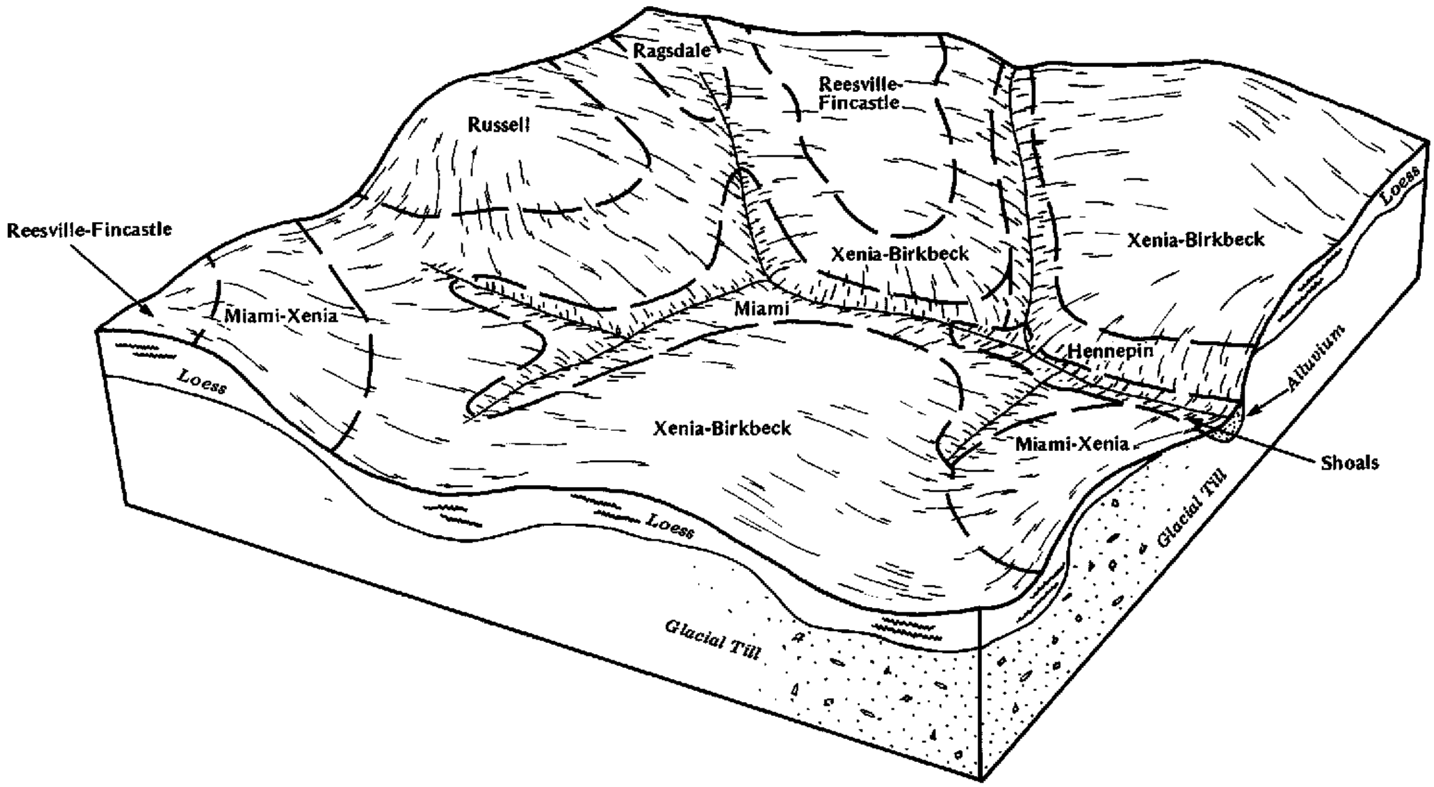


Figure 2.—Pattern of soils and parent material in the Xenia-Birkbeck association.

drained Hennepin soils on steep breaks; the well drained, moderately sloping to moderately steep Miami soils on side slopes and knobs; the very poorly drained Ragsdale soils in depressions and drainageways; the well drained Russell soils on ridgetops; and the somewhat poorly drained Shoals soils on narrow bottom land.

About 80 percent of this association is used for corn or soybeans. Some areas are used for wheat, hay, woodland, or pasture. Raising beef cattle is an important enterprise. The Birkbeck soils and the gently sloping Xenia soils are well suited to row crops, wheat, and hay, but the moderately sloping Xenia soils are only fairly well suited. Erosion is the main management concern if row crops are grown. A drainage system is needed in some areas.

The soils in this association are well suited to trees. No major hazards or limitations affect planting or harvesting.

The soils in this association are fairly well suited to building site development. They are poorly suited to sanitary facilities because of wetness and moderately slow permeability.

10. Miami-Crosby Association

Strongly sloping to nearly level, well drained and somewhat poorly drained soils formed in silty material and glacial drift; on uplands

The soils in this association are on till plains dissected by many drainageways and small streams. Ridges are between the drainageways in some areas. Some areas along the larger streams are characterized by steep, short breaks. Slopes range from 0 to 18 percent.

This association makes up about 5 percent of the county. It is about 44 percent Miami soils, 32 percent Crosby soils, and 24 percent soils of minor extent.

Miami soils are well drained and are on knobs and on breaks along drainageways. Typically, they have a surface layer of brown silt loam and a subsoil of dark yellowish brown and yellowish brown clay loam.

Crosby soils are somewhat poorly drained and are on flats, on rises, and along drainageways. Typically, they have a surface layer of dark grayish brown silt loam and a subsoil of yellowish brown and grayish brown, mottled silty clay loam, clay loam, and loam.

The soils of minor extent in this association are the very poorly drained Treaty soils along drainageways, the well drained Hennepin soils on breaks, and the moderately well drained Beckville and Lobdell and well drained Chagrin soils on bottom land.

About 75 percent of this association is used for corn or soybeans. The rest is used for wheat, hay, or pasture. Raising beef cattle and hogs is an important enterprise. The Crosby soils and the gently sloping Miami soils are well suited to row crops, wheat, and hay, but the moderately sloping and strongly sloping Miami soils are only fairly well suited or are poorly suited. Erosion is the main concern if row crops are grown. A drainage system is needed in areas of the Crosby soils.

The soils in this association are well suited to trees. No major hazards or limitations affect planting or harvesting.

The Crosby soils are poorly suited to building site development and sanitary facilities because of wetness. The Miami soils are fairly well suited to building site development. They are poorly suited to sanitary facilities because of moderately slow permeability.

Nearly Level to Strongly Sloping, Well Drained Soils on Uplands and Terraces

These soils make up about 14 percent of the county. They generally are subject to erosion. In some areas they are droughty. The less sloping areas are used for corn or soybeans. The more sloping areas are used mainly for hay and pasture, but a few are used for corn or soybeans. A few areas are wooded. The soils are fairly well suited to cultivated crops. They are well suited to woodland, sanitary facilities, and building site development.

11. Ockley-Rush Association

Nearly level to moderately sloping, well drained soils formed in silty material and loamy and gravelly sand outwash; on terraces

The soils in this association are on terraces at several different elevations along the larger streams. In some areas the terraces are as much as a mile wide. Slopes range from 0 to 12 percent.

This association makes up about 5 percent of the county. It is about 35 percent Ockley soils, 30 percent Rush soils, and 35 percent soils of minor extent (fig. 3).

The nearly level to moderately sloping Ockley soils are on the lower terraces. Typically, they have a surface layer of dark brown silt loam and a subsoil of dark yellowish brown, brown, reddish brown, and dark reddish brown silty clay loam, loam, gravelly sandy clay loam, gravelly sandy loam, and gravelly coarse sandy loam.

The nearly level and gently sloping Rush soils are on the higher terraces. Typically, they have a surface layer of dark grayish brown silt loam and a subsoil of dark yellowish brown, brown, and dark brown silt loam, silty clay loam, clay loam, gravelly loam, and gravelly sandy loam.

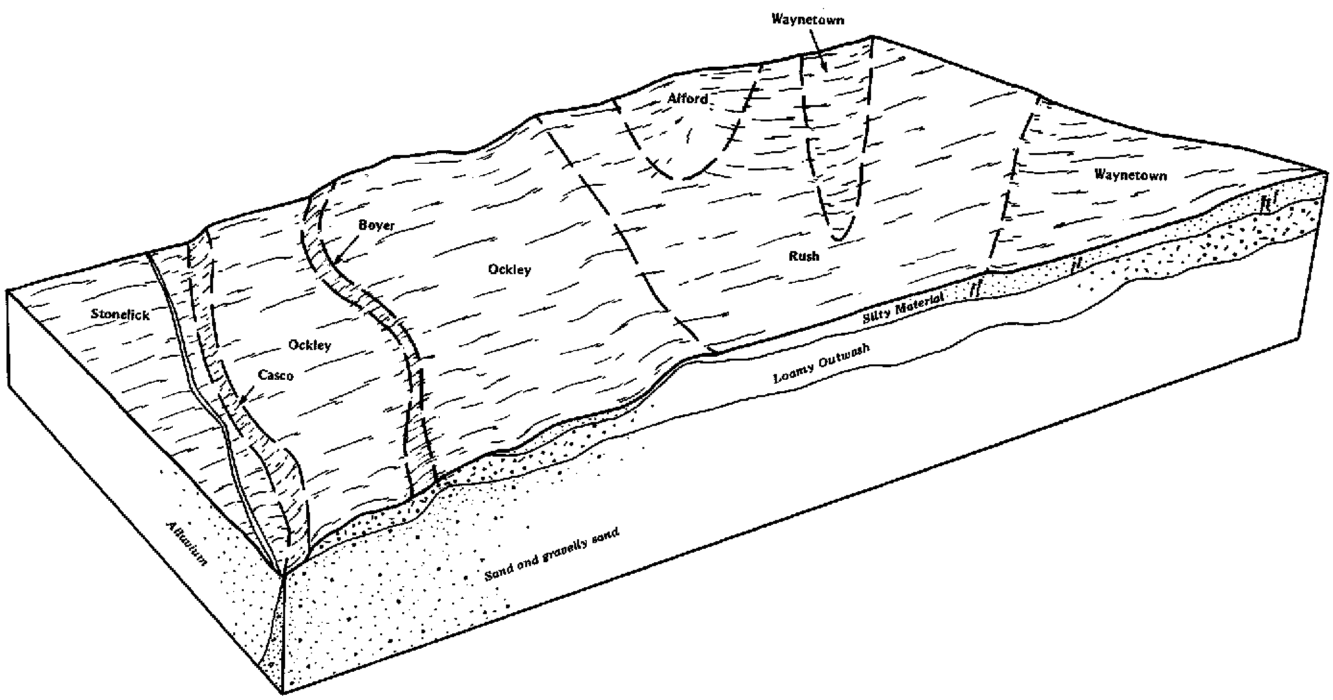


Figure 3.—Pattern of soils and parent material in the Ockley-Rush association.

The soils of minor extent in this association are the well drained, nearly level Alford soils on broad terraces; the somewhat poorly drained Waynetown soils on the lower rises; the somewhat poorly drained Shadeland and well drained Ockley soils on bedrock terraces; the well drained Ormas soils on low terraces; the well drained Boyer, Casco, and Rodman soils on breaks; and the well drained Stonelick soils on flood plains. The Ockley soils have a bedrock substratum.

About 85 percent of this association is used for corn or soybeans. A small acreage is used for wheat, woodland, hay, or pasture. The Rush soils and the nearly level and gently sloping Ockley soils are well suited to row crops, wheat, and hay, but the moderately sloping Ockley soils are only fairly well suited. Erosion and droughtiness are the main management concerns.

The soils in this association are suited to trees. No major hazards or limitations affect planting or harvesting.

The soils in this association are suited to building site development and sanitary facilities. Pits in areas of this association are a source of sand and gravel.

12. Martinsville, Till Substratum-Ockley, Till Substratum Association

Gently sloping to strongly sloping, well drained soils formed in loamy glaciofluvial deposits or in silty material and loamy and gravelly sand deposits; on uplands

The soils in this association are on till plains and moraines dissected by many drainageways. Some areas along streams are characterized by steep, short breaks. Slopes range from 2 to 18 percent.

This association makes up about 9 percent of the county. It is about 40 percent Martinsville soils, 34 percent Ockley soils, and 27 percent soils of minor extent.

Martinsville and Ockley soils are on knobs and breaks. Typically, they have a surface layer of brown silt loam. The subsoil of the Martinsville soils is dark yellowish brown, brown, and strong brown silt loam, clay loam, sandy clay loam, coarse sandy loam, and loamy coarse sand. The subsoil of the Ockley soils is dark yellowish brown and brown clay loam, sandy clay loam, gravelly sandy clay loam, and gravelly sandy loam.

The soils of minor extent in this association are the very poorly drained Belleville and Wallkill soils in depressions, the somewhat poorly drained Starks soils on flats and in drainageways, and the poorly drained Washtenaw soils on toe slopes and in depressions.

About 80 percent of this association is used for corn or soybeans. A small acreage is used for wheat, hay, woodland, or pasture. Some of the steeper areas are used as permanent pasture. The suitability for row crops, wheat, hay, building site development, and sanitary facilities is good to poor, depending on the slope. Erosion is the main management concern if cultivated crops are grown.

The soils in this association are well suited to trees. No major hazards or limitations affect planting or harvesting.

Moderately Steep to Very Steep, Well Drained Soils on Uplands

These soils make up about 3 percent of the county. Nearly all areas are used as woodland. Because of the slope, the hazard of erosion, and droughtiness, the soils are poorly suited to most uses. They are best suited to woodland. In some areas, however, they are poorly suited to trees because of a shallow depth to bedrock. Areas along Sugar Creek have esthetic value. Those in Shades State Park are used for hiking trails.

13. Hennepin-Weikert Association

Moderately steep to very steep, well drained soils formed in glacial drift or in material weathered from sandstone, siltstone, and shale; on uplands

The soils in this association are on breaks along Sugar Creek and its larger tributaries. Many areas are characterized by nearly perpendicular slopes and by small draws that cut into the adjacent till plains. Slopes range from 18 to 90 percent.

This association makes up about 3 percent of the county. It is about 52 percent Hennepin soils, 22 percent Weikert soils, and 26 percent soils of minor extent (fig. 4).

The moderately steep to very steep Hennepin soils are mainly on the upper part of the breaks. Typically, they have a surface layer of very dark grayish brown silt loam and a subsoil of dark yellowish brown silt loam and yellowish brown loam.

The very steep Weikert soils are mainly on the lower part of the breaks. In some areas they make up the entire break. Typically, they have a surface layer of black channery loam and a subsoil of dark yellowish brown channery loam.

The soils of minor extent in this association are the well drained Russell soils on ridgetops, the somewhat poorly drained Shadeland soils on narrow bedrock terraces, and the well drained Stonelick Variant soils on narrow bottom land. Also of minor extent are areas where bedrock crops out on the breaks.

About 98 percent of this association is woodland. Some of the less sloping areas are used for hay and pasture. A few areas of exposed bedrock are barren. Much of the association is within Shades State Park and is used for hiking and nature trails. The soils are generally unsuited to row crops, wheat, and hay because of the slope and droughtiness. They are generally unsuited to building site development and sanitary facilities because of the slope. They are poorly suited to trees because of the slope and a limited rooting depth. The slope severely limits the use of logging equipment.

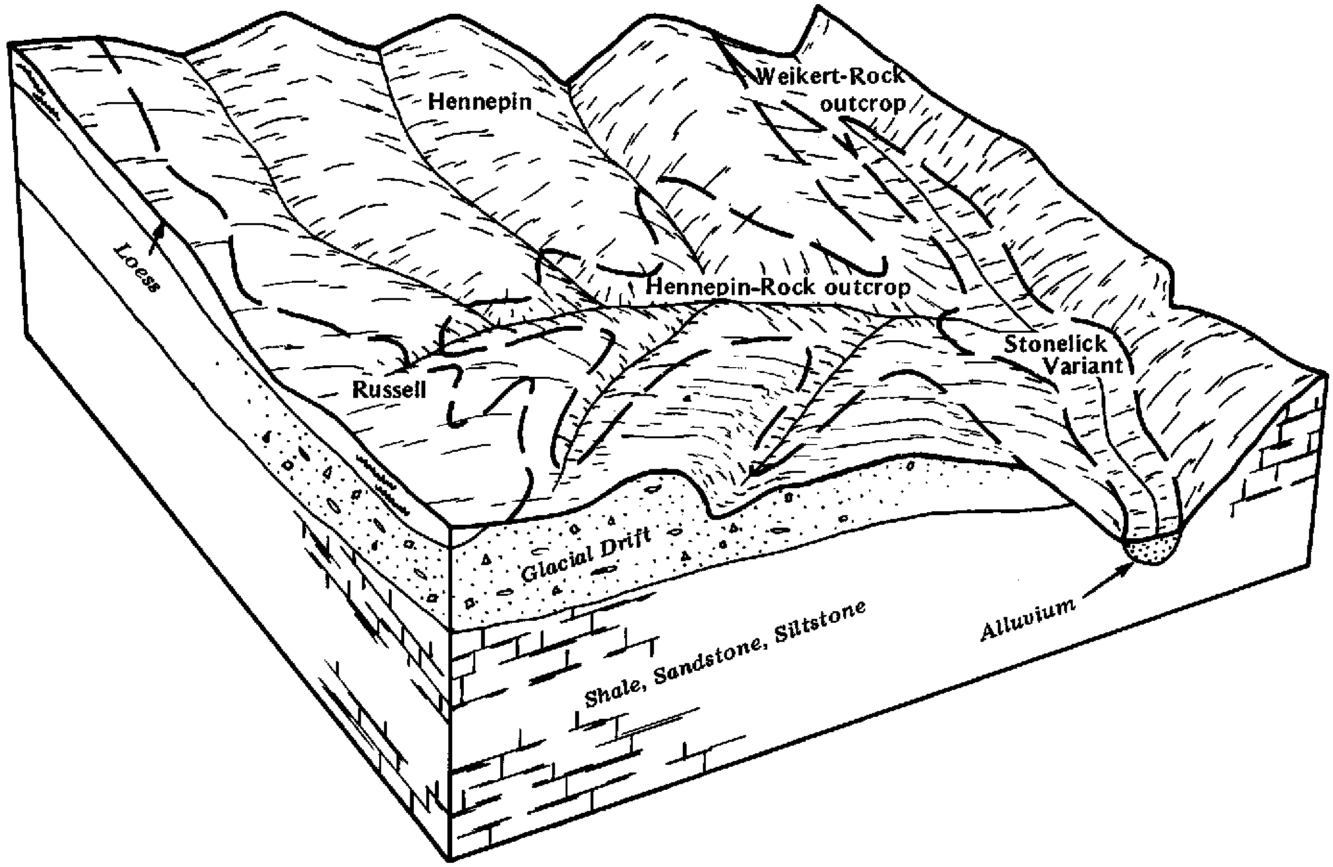


Figure 4.—Pattern of soils and parent material in the Hennepin-Weikert association.

Broad Land Use Considerations

The general soil map helps to identify broad areas in the county where the soils are likely to be suitable for different uses. The general soil map is helpful in broad land use planning, but it cannot be used for the selection of sites for specific urban structures.

Associations 1 through 12 are generally used for farming. Associations 2 through 7 are well suited to corn and soybeans if the soils are drained. Most of these soils are drained, and a high level of management is being applied. Flooding is a hazard in association 1. Also, many minor soils in this association have a limited available water capacity and are droughty in some years. Associations 8 through 12 are generally well suited to farming, but the slope is a limitation. Erosion is a hazard if row crops are grown. Also, a drainage system is needed in many of the soils in these associations. Association 13 is generally unsuited to crops because of the slope.

Most of the associations are well suited to woodland, but only a few areas are managed for the commercial production of trees. Commercially valuable trees are most common on the moderately well drained and well drained soils, which are dominantly in associations 9, 11, and 12.

The rate of urban development in the county is rapid only in a narrow band around Crawfordsville. Many of the associations are poorly suited to urban development. Association 1 is severely limited as a site for urban uses because of flooding. Because of wetness, associations 2 through 7 are poorly suited to these uses and associations 8, 9, and 10 are only fairly well suited. Association 13 is poorly suited because of the slope. Association 11 and many areas in association 12 are well suited to urban development.

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, Camden silt loam, 2 to 6 percent slopes, is a phase in the Camden 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. Crosby-Miami silt loams, 2 to 6 percent slopes, eroded, 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, quarries, 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 coincide 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, 27 capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

AfA—Alford silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on terraces and outwash plains. Areas are irregularly shaped and are 10 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown, friable silt loam; the next part is strong brown, firm silty clay loam; and the lower part is brown, firm silt loam. The underlying material to a depth of about 60 inches is dark yellowish brown silt loam. In a few places gray mottles are at a depth of 36 to 60 inches. In some areas the surface soil is as much as 20 inches thick. In a few areas gravelly sand is at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Reesville soils in depressions. Also included are the well drained Rush soils. These soils are in positions on the landscape similar to those of the Alford soil. The lower part of their solum formed in loamy outwash. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the Alford soil. Available water capacity is high. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are used for corn, soybeans, or wheat. A few are used for hay.

This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to pasture grasses and legumes, including deep-rooted legumes, such as alfalfa. The main management concern is overgrazing. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, and girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is well suited to septic tank absorption fields.

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

Bc—Beckville loam, occasionally flooded. This nearly level, deep, moderately well drained soil is on flood plains. It is occasionally flooded for brief periods during the winter and spring. Areas are 3 to 40 acres in size. Most are elongated and are parallel to streams, but some are in oxbows and sloughs, which meander across the flood plains.

In a typical profile, the surface layer is very dark grayish brown loam about 11 inches thick. The upper 10 inches of the underlying material is brown, mottled, friable loam. The lower part to a depth of about 60 inches is brown, dark grayish brown, and grayish brown, mottled sandy loam and loam. In some areas the surface layer is silt loam. In other areas loose sand and gravel are below a depth of 40 inches. In a few areas bedrock is at a depth of 4 to 6 feet. In places the soil has no mottles within a depth of 40 inches. In a few places the subsoil contains more clay and less sand.

Included with this soil in mapping are small areas of the well drained Stonelick soils in the higher landscape positions and the very poorly drained Cohoctah soils in the lower depressions. Included soils make up about 10 percent of the map unit.

Permeability is moderately rapid in the Beckville soil. Available water capacity is high. The water table is at a depth of 1.5 to 3.0 feet in the spring and winter. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are used for corn or soybeans. Some are used for pasture and hay. A drainage system of subsurface drains and open ditches has been established in some areas. Small inaccessible areas and areas dissected by overflow channels are wooded.

This soil is well suited to corn and soybeans, but the flooding is a major hazard. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to pasture grasses and legumes, but the flooding is a hazard. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the flooding and the wetness, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads because of the flooding and frost action. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by frost action and flooding.

The land capability subclass is IIw. The woodland ordination symbol is 7A.

Be—Belleville loamy sand. This nearly level, deep, very poorly drained soil is dominantly in depressions and potholes on moraines, but in a few areas it is in depressions on till plains. It is subject to ponding. Areas are irregularly shaped and are 4 to 20 acres in size.

In a typical profile, the surface layer is black loamy sand about 11 inches thick. The upper 19 inches of the underlying material is gray and light brownish gray, mottled, loose sand. The lower part to a depth of about 60 inches is grayish brown and gray, mottled silty clay loam. In places the surface layer is silt loam or loam. In a few places the entire solum contains carbonates. In a few areas the underlying material is gravelly clay loam, gravelly loam, or stratified sandy loam and silt loam. In a few places the sandy mantle is as thin as 8 inches. In a few areas the soil is on slight rises and is slightly better drained.

Included with this soil in mapping are small areas of the very poorly drained Wallkill soils in the slightly lower depressions. These soils have organic material within a depth of 60 inches. Also included are areas of the very poorly drained Milford soils. These soils have more clay in the subsoil than the Belleville soil. They are in positions on the landscape similar to those of the Belleville soil. Included soils make up about 15 percent of the map unit.

Permeability is rapid in the sandy part of the Belleville soil and moderately slow in the underlying material. The water table is often near or above the surface during the winter and early spring. Surface runoff is very slow or ponded. Available water capacity is moderate. Organic matter content is moderately low or moderate in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas are drained and are used for corn or soybeans. If drained, this soil is fairly well suited to these crops. Because of the wetness in the winter and early spring, it is poorly suited to small grain. The wetness is the main limitation, but drought is a hazard in dry years. A drainage system of subsurface drains and open ditches has been established in most areas. A subsurface tile drainage system works fairly well. If the tile is installed too deep in the underlying clayey and silty sediments, however, water may not move into the tile fast enough. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth, increases the organic matter content, and reduces the hazard of soil blowing.

Because of the wetness in the early spring, this soil is poorly suited to grasses and legumes for hay and pasture. A drainage system is generally needed. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

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. Planting large seedlings reduces the seedling mortality rate. Species that can withstand the wetness should be favored in the stands. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Plant competition can be controlled by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings. It is severely limited as a site for local roads because of the ponding and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and frost action. The soil is generally unsuitable as a site for septic tank absorption fields because of the ponding and the moderately slow permeability in the underlying material.

The land capability classification is IIIw. The woodland ordination symbol is 1W.

BoA—Bowes Variant silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on outwash plains. Areas are irregularly shaped and are 3 to 25 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 51 inches thick. In sequence downward, it is dark yellowish brown, firm silty clay loam; dark yellowish brown, mottled, firm silty clay loam; strong brown, mottled, firm gravelly sandy clay loam; and dark yellowish brown and grayish brown, mottled, firm gravelly sandy loam and gravelly sandy clay loam. The underlying material to a depth of about 66 inches is grayish brown gravelly coarse sand. In a few places the subsoil is not mottled. In some areas the dark surface layer is as much as 12 inches thick. In several areas the silty material is less than 28 inches thick.

Included with this soil in mapping are the somewhat poorly drained Millbrook Variant soils on the slightly lower rises and the well drained Waupecan soils on the slightly higher rises. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Bowes Variant soil and rapid in the underlying material. Available water capacity is high. Surface runoff is slow. The water table is at a depth of 2 to 6 feet during the winter and early spring. Organic matter content is moderate in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are used for corn or soybeans. A few are used for small grain or hay.

This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to pasture grasses and legumes, including deep-rooted legumes, such as alfalfa. The main management concern is overgrazing. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

Because of the wetness and the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Perimeter foundation drains help to lower the water table. Properly designing foundations helps to prevent damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness. Installing perimeter subsurface drains helps to lower the water table.

The land capability classification is I. No woodland ordination symbol is assigned.

BpC3—Boyer gravelly sandy loam, 6 to 15 percent slopes, severely eroded. This moderately sloping, well drained soil is on terrace breaks. It is moderately deep over gravelly coarse sand. Areas are 3 to 25 acres in size. They are mostly elongated, but several are irregularly shaped.

In a typical profile, the surface layer is dark yellowish brown gravelly sandy loam about 6 inches thick. The subsoil is about 23 inches thick. The upper part is dark reddish brown, firm gravelly coarse sandy loam and gravelly sandy loam, and the lower part is dark brown, very friable gravelly loamy sand. The underlying material to a depth of about 60 inches is brown gravelly coarse sand. In a few places loam till is within a depth of 60 inches. In a few areas the surface layer is loam or silt loam. In a few places the depth to loose sand and gravel is more than 40 or less than 20 inches. In a few areas bedrock is within a depth of 60 inches. In a few places the content of gravel in the surface layer is as much as 60 percent. In places the surface layer contains cobbles.

Included with this soil in mapping are the well drained Rush and Ockley soils in the less sloping areas. These soils contain more clay in the subsoil than the Boyer soil. They make up about 10 percent of the map unit.

Permeability is moderately rapid in the subsoil of the Boyer soil and very rapid in the underlying material. Available water capacity is low. Surface runoff is rapid. Organic matter content is low or moderately low in the surface layer. This layer can be tilled only within a narrow range in moisture content.

Most areas of this soil are used for corn, soybeans, or small grain. A few are pastured or wooded.

Because of the erosion hazard and droughtiness, this soil is poorly suited to corn and soybeans. It is suited to small grain crops that are seeded in the fall or early spring. The high content of gravel in the surface layer hinders tillage and germination. A cropping sequence dominated by grasses and legumes, terraces, and grassed waterways help to control erosion. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content.

This soil is fairly well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing is the main management concern. It results in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. Plant competition is the main management concern. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the slope, this soil is moderately limited as a site for dwellings and for local roads and streets. Buildings should be constructed in the less sloping areas or designed so that they conform to the natural slope of the land. Building on random lots, maintaining as much of the existing vegetation as possible, and seeding exposed areas as soon as possible after construction help to control erosion. Local roads and streets should be built on the contour. The soil is severely limited as a site for septic tank absorption fields because of a poor filtering capacity in the underlying material. Seepage of effluent into underground water supplies may be a problem.

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

BrA—Brenton silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on till plains. Areas generally are irregularly shaped and are 3 to 20 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 12 inches thick. The subsoil is about 46 inches thick. The upper part is brown and yellowish brown, mottled, firm silty clay loam and clay loam, and the lower part is yellowish brown, mottled, firm silt loam. The underlying material to a depth of about 65 inches is yellowish brown, mottled silt loam. In some areas the depth to firm till is less than 60 inches. In a few places the content of the gravel in the lower part of the solum is as much as 15 percent.

Included with this soil in mapping are the poorly drained Drummer soils in depressions and the moderately well drained Proctor soils on the higher rises. Included soils make up about 12 percent of the map unit.

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

Most areas are drained by subsurface drains and open ditches and are used for corn, soybeans, or small grain. If drained, this soil is well suited to these crops. The wetness is the main limitation. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is wet are the main management concerns. They result in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

Because of the wetness, this soil is severely limited as a site for dwellings and for septic tank absorption fields. Surface and subsurface drains help to overcome this limitation on building sites. Dwellings should be constructed without basements. Perimeter interceptor subsurface drains help to lower the water table in the absorption fields. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

The land capability classification is IIw. No woodland ordination symbol is assigned.

BxA—Brenton Variant silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on outwash plains. Areas are irregularly shaped and are 3 to 150 acres in size.

In a typical profile, the surface layer is very dark gray silt loam about 11 inches thick. The subsoil is about 48 inches thick. In sequence downward, it is brown, mottled, firm silt loam; grayish brown and gray, mottled, firm silty clay loam; yellowish brown, mottled, firm silty clay loam and silt loam; and gray, firm gravelly fine sandy loam. The underlying material to a depth of about 65 inches is gray gravelly loamy coarse sand. In places the dark surface layer is as thin as 8 inches. In a few places firm glacial till is at a depth of 40 to 65 inches.

Included with this soil in mapping are small areas of the moderately well drained Bowes Variant soils on the higher rises and areas of the very poorly drained Mahalasville soils in depressions. Mahalasville soils have a gravelly substratum. Included soils make up about 15 percent of the map unit.

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

Most areas are drained by subsurface drains and open ditches and are used for corn, soybeans, or small grain. If drained, this soil is well suited to these crops. The wetness is the main limitation. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings and for septic tank absorption fields. Surface and subsurface drains help to overcome this limitation on building sites. Dwellings should be constructed without basements. Perimeter interceptor subsurface drains help to lower the water table in absorption fields. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

The land capability classification is IIw. No woodland ordination symbol is assigned.

CbA—Camden silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on till plains, moraines, and outwash plains. Areas generally are irregularly shaped and are 3 to 100 acres in size.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 54 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the next part is brown, firm loam and fine sandy loam; and the lower part is brown, friable loam and fine sandy loam. The underlying material to a depth of about 80 inches is yellowish brown sandy loam. In some areas the silty material is more than 40 inches thick. In a few places the content of the gravel is more than 10 percent in the lower part of the subsoil. In places mottles are within a depth of 30 inches. In a few areas the surface layer is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Starks and well drained Ockley and Martinsville soils. Starks soils are in slight depressions. Ockley and Martinsville soils have a till substratum and have more sand and less silt in the subsoil than the Camden soil. They are in landscape positions similar to those of the Camden soil. Also included are a few areas where the surface layer is sandy loam or loam. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Camden soil. Available water capacity is high. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are used for corn, soybeans, or small grain. Some are used for hay and pasture, and a few are wooded.

This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Deep-rooted legumes grow well. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, and girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. Properly designing foundations and footings and installing foundation drain tile help to prevent the damage caused by shrinking and swelling. The soil is suitable as a site for dwellings with basements. It is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is well suited to septic tank absorption fields.

The land capability classification is I. The woodland ordination symbol is 7A.

CbB—Camden silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on moraines, outwash plains, and till plains. Areas are irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 64 inches thick. The upper part is dark yellowish brown, firm silty clay loam, and the lower part is brown and strong brown, firm and friable loam and fine sandy loam. The underlying material to a depth of about 80 inches is yellowish brown sandy loam. In a few places glacial till is within a depth of 40 inches. In a few areas mottles are as shallow as 30 inches. In some places the underlying material is stratified. In other places the silty material is more than 40 inches thick.

Included with this soil in mapping are areas of the somewhat poorly drained Starks and Fincastle soils in swales and along drainageways. Also included are the well drained Ockley and Martinsville soils and a few areas of severely eroded soils that have more clay in the surface layer than the Camden soil. Ockley and Martinsville soils have a till substratum and have more sand and less silt in the subsoil than the Camden soil. They are in landscape positions similar to those of the Camden soil. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the Camden soil. Available water capacity is high. Surface runoff is medium. Organic matter content is moderately low 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 corn, soybeans, or small grain. A few are used for hay, pasture, or woodland.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main management concern. It can be controlled by grassed waterways and by cropping systems that include grasses and legumes. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Deep-rooted legumes grow well. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. Plant competition is the main management concern. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. Properly designing foundations and footings and installing foundation drain tile help to prevent the damage caused by shrinking and swelling. The soil is well suited to dwellings with basements and to septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

The land capability classification is IIe. The woodland ordination symbol is 7A.

CbC2—Camden silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on moraines. Areas are irregularly shaped and are 3 to 20 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 7 inches thick. It has a few chunks of strong brown subsoil material. The subsoil is about 57 inches thick. The upper part is strong brown and brown, firm silty clay loam and loam; the next part is brown and strong brown, friable sandy loam, loam, and silt loam; and the lower part is yellowish brown, firm clay loam. The underlying material to a depth of about 80 inches is yellowish brown loam. In a few places glacial till is within a depth of 40 inches. In a few areas where slopes are 6 to 8 percent, mottles are as shallow as 40 inches. In some places the underlying material is stratified. In other places the silty material is more than 40 inches thick.

Included with this soil in mapping are areas of the well drained Martinsville and Ockley soils. These soils have a till substratum and have more sand and less silt in the subsoil than the Camden soil. They are in landscape positions similar to those of the Camden soil. Also included are areas of severely eroded soils that have more clay in the surface layer than the Camden soil. Included soils make up about 20 percent of the map unit.

Permeability is moderate in the Camden soil. Available water capacity is high. Surface runoff is medium. Organic matter content is moderately low 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 corn, soybeans, or small grain. A few are used for hay, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main management concern. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. Plant competition is the main management concern. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings without basements. The slope also is a moderate limitation on sites for dwellings with basements and on sites for septic tank absorption fields. Properly designing foundations and footings and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. Buildings and absorption fields should be designed so that they conform to the natural slope of the land. In some areas land shaping is needed. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

The land capability classification is IIIe. The woodland ordination symbol is 7A.

CcF—Casco loam, 18 to 35 percent slopes. This moderately steep and steep, well drained soil is on terrace breaks. It is shallow over gravelly coarse sand. Areas are 5 to 45 acres in size. They are elongated and generally parallel streams.

In a typical profile, the surface layer is very dark grayish brown loam about 4 inches thick. The subsoil is about 14 inches thick. The upper part is dark brown, firm gravelly clay loam, and the lower part is brown, firm gravelly loam. The underlying material to a depth of about 60 inches is yellowish brown gravelly coarse sand. In many places the solum is more than 20 inches thick. In a few places firm glacial till is within a depth of 40 inches.

Included with this soil in mapping are well drained soils that formed in glacial till. Also included are the well drained Rush and Ockley soils in the less sloping areas. Rush and Ockley soils have a solum that is thicker than that of the Casco soil. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the upper part of the Casco soil and very rapid in the underlying material. Available water capacity is low. Surface runoff is rapid or very rapid. Organic matter content is moderately low in the surface layer.

Most areas are wooded. A few have gravel pits. Because of the slope, this soil is generally unsuited to corn, soybeans, and small grain and to forage crops. It is poorly suited to trees. The erosion hazard, the equipment limitation, the windthrow hazard, and seedling mortality are the main concerns in managing woodland. In some areas the logs should be yarded uphill with a cable. Unless precautionary measures are applied, ruts can form up and down the slope. Because of seedling mortality, containerized nursery stock or overstocking is needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the slope, this soil is generally unsuitable as a site for dwellings, local roads and streets, and septic tank absorption fields. Alternative sites should be selected.

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

Ce—Ceresco loam, occasionally flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is occasionally flooded for long periods during the spring. Areas are 3 to 60 acres in size. They are generally elongated and are parallel to creeks and streams.

In a typical profile, the surface layer is very dark grayish brown loam 9 inches thick. The subsurface layer is very dark grayish brown, mottled loam about 10 inches thick. The subsoil is about 25 inches thick. The upper part is brown, mottled, friable loam; the next part is yellowish brown, mottled, friable sandy loam and very friable loamy fine sand; and the lower part is dark yellowish brown, mottled, friable sandy loam. The underlying material to a depth of about 60 inches is pale brown gravelly coarse sand. In some places the subsoil contains more clay and less sand. In other places the surface layer and the upper part of the subsoil are silt loam. In a few places gravelly coarse sand is as shallow as 24 inches. In a few areas the surface layer is lighter colored.

Included with this soil in mapping are the very poorly drained Cohoctah soils in the lower landscape positions and the well drained Stonelick soils in the slightly higher positions. Also included are a few small areas that are rarely flooded. Included soils make up about 15 percent of the map unit.

Permeability is moderate or moderately rapid in the upper part of the Ceresco soil and very rapid in the underlying material. Available water capacity is moderate. The water table is at a depth of 1 to 2 feet in the fall, winter, and spring. Surface runoff is slow. Organic matter content is moderate in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are used for corn or soybeans. A few are used for pasture or woodland.

If drained, this soil is fairly well suited to corn and soybeans. The wetness is the main limitation, and the flooding is a hazard. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to pasture grasses and legumes. A drainage system generally is needed. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. The equipment limitation and plant competition are the main management concerns. Competing vegetation can be controlled by cutting, spraying, or girdling. Equipment should be used only during dry periods or when the ground is frozen.

Because of the wetness and the flooding, this soil is generally unsuitable as a site for dwellings. It is generally unsuitable as a site for septic tank absorption fields because of the wetness, the flooding, and a poor filtering capacity in the underlying material. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the flooding and frost action. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by frost action and flooding. The base should be strengthened with suitable material.

The land capability classification is IIIw. The woodland ordination symbol is 3W.

Cg—Chagrin silt loam, rarely flooded. This nearly level, deep, well drained soil is on flood plains. Areas generally are elongated and are parallel to streams. They are 5 to 40 acres in size.

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, friable silt loam and loam, and the lower part is dark yellowish brown, friable sandy loam. The underlying material to a depth of about 60 inches is yellowish brown sandy loam. In some places the surface layer is very dark grayish brown. In a few places carbonates are within a depth of 40 inches. In a few areas strata of sand and gravelly sand are below a depth of 40 inches. In a few places the soil is occasionally flooded.

Included with this soil in mapping are the moderately well drained Lobdell soils in swales and a few areas of the well drained Stonelick soils on the slightly lower flood plains. Stonelick soils have more sand in the subsoil than the Chagrin soil. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the Chagrin soil. Available water capacity is high. Surface runoff is slow. The water table is at a depth of 4 to 6 feet in the winter and early spring. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for corn or soybeans. A few are used for small grain, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Deep-rooted legumes grow well. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. Plant competition is the main management concern. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is moderately limited as a site for local roads because of the flooding and frost action. Constructing the roads on compacted fill material that raises the roadbed above flood levels and providing adequate culverts and side ditches minimize the damage caused by flooding and frost action.

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

Ck—Cohoctah loam, frequently flooded. This nearly level, deep, very poorly drained soil is in depressions and oxbows on flood plains. It is frequently flooded for brief or long periods during the winter and spring. Areas are 3 to 200 acres in size. They are generally elongated and are parallel to streams.

In a typical profile, the surface layer is very dark grayish brown loam about 9 inches thick. The subsurface layer is about 12 inches thick. The upper part is very dark gray loam, and the lower part is very dark gray, mottled fine sandy loam. The subsoil is dark gray, mottled, firm and friable fine sandy loam about 29 inches thick. The underlying material to a depth of about 60 inches is gray, mottled, stratified loam and sandy loam. In a few places loose sand is as shallow as 30 inches. In some areas the surface layer is mucky. In a few places as much as 12 inches of light colored overwash is at the surface. In places the dark surface layer is as much as 30 inches thick.

Included with this soil in mapping are small areas of the moderately well drained Beckville soils in the slightly elevated landscape positions and small areas of the well drained Stonelick soils in the higher positions. Also included are a few areas in oxbows. These areas are ponded most of the year. Included soils make up about 15 percent of the map unit.

Permeability is moderately rapid in the Cohoctah soil. Available water capacity is high. The water table is often at or near the surface during the fall, winter, and early spring. Surface runoff is very slow. Organic matter content is moderate in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are drained and are used for corn or soybeans. Some areas are used for hay and pasture. Undrained areas are wooded.

If drained, this soil is fairly well suited to corn and soybeans. The wetness and the flooding are the main management concerns. A drainage system of open ditches and subsurface drains has been established in most areas. A subsurface tile drainage system works well. Small grain planted in the fall and early spring may be damaged by floodwater even if a satisfactory drainage system has been established for row crops. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

Because of the wetness and the flooding, this soil is only fairly well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment should be used only during very dry periods or when the ground is frozen. Special site preparation, such as bedding, reduces the seedling mortality rate. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and for septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the flooding, frost action, and the wetness. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by frost action, wetness, and flooding.

The land capability classification is IIIw. The woodland ordination symbol is 3W.

CwA—Crosby silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on till plains. Areas are irregularly shaped and are 3 to 100 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 28 inches thick. The upper part is yellowish brown, mottled, firm silty clay loam; the next part is grayish brown, mottled, firm clay loam; and the lower part is yellowish brown, mottled, firm clay loam and loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some places the surface layer is loam. In other places the lower part of the subsoil is sandy loam, sandy clay loam, or the gravelly analogs of these textures. In some areas the underlying material is sandy loam till. In other areas the solum is thicker and contains more silt and less sand. In places the upper part of the subsoil is not mottled.

Included with this soil in mapping are small areas of the well drained Miami soils on rises and side slopes and the very poorly drained Treaty soils in swales and depressions. These soils make up about 10 percent of the map unit.

Permeability is slow in the subsoil of the Crosby soil and moderately slow or slow in the underlying material. Available water capacity is high. The water table is at a depth of 1 to 3 feet in the winter and early spring. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas are drained by subsurface drains and open ditches and are used for corn, soybeans, or small grain. Some are used for hay or pasture. A few are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface tile drainage system works fairly well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

If drained, this soil is well suited to pasture grasses and legumes. These plants can be grown in some undrained areas, but a drainage system generally is beneficial. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

This soil is well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Perimeter interceptor subsurface drains help to overcome the wetness. Filling or mounding improves the ability of the field to absorb the effluent.

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

CyB2—Crosby-Miami silt loams, 2 to 6 percent slopes, eroded. These gently sloping, deep soils are on rises on till plains and on slopes adjacent to drainageways. The somewhat poorly drained Crosby soil is on the broader ridgetops, on foot slopes, and in swales. The well drained Miami soil is on the more sloping knolls and narrow ridgetops. Areas are irregularly shaped and are 3 to 160 acres in size. They are about 55 percent Crosby soil and 40 percent Miami soil. The two soils occur as areas so intricately mixed or so small that mapping them separately was not practical.

In a typical profile of the Crosby soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 24 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam, and the lower part is clay loam and loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In places the depth to glacial till is more than 40 inches. In a few places the lower part of the subsoil is stratified silt loam to sand. In a few areas glacial till is within a depth of 15 inches.

In a typical profile of the Miami soil, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 21 inches thick. The upper part is brown, firm clay loam, and the lower part is brown and dark yellowish brown, firm clay loam and loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In a few places the depth to glacial till is more than 40 or less than 24 inches. In a few areas the lower part of the subsoil is stratified sandy loam to gravelly loamy sand. In some places the surface layer is loam or clay loam. In other places the subsoil is mottled within a depth of 20 inches.

Included with these soils in mapping are the very poorly drained Treaty soils in drainageways. These included soils make up about 5 percent of the map unit.

Permeability is slow in the subsoil of the Crosby soil and moderately slow or slow in the underlying material. It is moderate in the subsoil of the Miami soil and moderately slow in the underlying material. Available water capacity is high in the Crosby soil and moderate in the Miami soil. The water table is at a depth of 1 to 3 feet during the winter and early spring in the Crosby soil. Surface runoff is medium on both soils. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are used for corn, soybeans, or small grain. A few are used as hayland, pasture, or woodland.

If erosion is controlled, these soils are well suited to corn, soybeans, and small grain. Erosion is the main hazard. The wetness of the Crosby soil also is a problem. Cropping systems that include grasses and legumes, diversions, and grassed waterways help to control erosion. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. A subsurface drainage system is needed in seepy areas at the base of slopes and in drainageways.

These soils are well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing are needed.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

The Crosby soil is severely limited as a site for dwellings because of the wetness. A foundation drainage system helps to overcome this limitation. The buildings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Perimeter interceptor subsurface drains help to lower the water table. Filling or mounding improves the ability of the field to absorb the effluent.

The Miami soil is moderately limited as a site for dwellings because of the shrink-swell potential. Properly designing foundations, footings, and basement walls, installing foundation drain tile, and backfilling with coarse textured material help to prevent structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of the shrink-swell potential and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Because of lateral seepage along the top of the glacial till, the effluent can surface in downslope areas. As a result, curtain drains are needed in upslope areas. Filling or mounding improves the ability of the field to absorb the effluent.

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

Cz—Cyclone silty clay loam. This nearly level, deep, poorly drained soil is in depressions on till plains. It is subject to ponding by runoff from the adjacent soils. Areas are 3 to 200 acres in size. They generally are irregularly shaped.

In a typical profile, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer also is black silty clay loam. It is about 4 inches thick. The subsoil is about 48 inches thick. The upper part is dark gray and grayish brown, mottled, firm silty clay loam; the next part is yellowish brown, mottled, firm silt loam; and the lower part is yellowish brown and grayish brown, firm loam. The underlying material to a depth of about 70 inches is yellowish brown, mottled fine sandy loam. In a few places light colored overwash covers the dark surface layer. In some areas the lower part of the subsoil is sandy loam or sandy clay loam that has thin layers of loamy sand, sand, or both.

Included with this soil in mapping are areas of the very poorly drained Milford soils in potholes and the somewhat poorly drained Crosby, Fincastle, and Starks soils on slight rises. Milford soils have more clay in the subsoil than the Cyclone soil. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Cyclone soil. Available water capacity is high. The water table is near or above the surface during the winter and early spring. Surface runoff is ponded or very low. Organic matter content is high in the surface layer. This layer can be tilled only within a narrow range in moisture content.

Most areas are drained and are used for corn or soybeans. A few are used for hay, pasture, or woodlots.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A drainage system of open ditches, surface drains, and subsurface drains has been established in most areas. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases organic matter content. The soil is well suited to fall plowing.

This soil is well suited to pasture grasses and legumes. A drainage system is needed. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in 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. 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. Special site preparation, such as bedding, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and for septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding, frost action, and low strength. The base should be strengthened with suitable coarse textured material. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding.

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

Du—Drummer silty clay loam. This nearly level, deep, poorly drained soil is in depressions on till plains. It is subject to ponding by runoff from the adjacent soils. Areas are 3 to 500 acres in size. Most are oval, but many are irregularly shaped.

In a typical profile, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is very dark gray silty clay loam about 5 inches thick. The subsoil is about 42 inches thick. The upper part is gray and grayish brown, mottled, firm silty clay loam, and the lower part is yellowish brown, mottled, firm loam. The underlying material to a depth of about 65 inches is yellowish brown, mottled, stratified silt loam and loam. In a few places firm loam till is within a depth of 45 inches. In places the silty material is more than 60 inches thick. In a few places the underlying material has strata of loamy sand or sand. In a few areas it contains marl and snail shells. In some areas lighter colored material has been deposited on the original black surface layer. In a few places the surface layer is loam, sandy loam, or loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and Raub soils on slight rises. These soils make up about 15 percent of the map unit.

Permeability is moderate in the Drummer soil. Available water capacity is high. The water table is often above or near the surface during the spring. Surface runoff is very slow or ponded. Organic matter content is high in the surface layer. This layer can become cloddy and hard to work if it is tilled when too wet. It can be tilled only within a narrow range in moisture content.

Most areas are drained and are used for corn or soybeans. A few are used for hay or pasture.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A drainage system of open ditches, subsurface drains, surface drains, or a combination of these has been established in most areas. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. The soil is well suited to fall plowing.

This soil is well suited to pasture grasses and legumes. Ponding is a hazard. A drainage system is needed. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, timely deferment of grazing, and pasture rotation minimize surface compaction and help to maintain tilth and plant density.

Because of the ponding, this soil is generally unsuitable as a site for dwellings. It is severely limited as a site for local roads because of the ponding, frost action, and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the ponding. Alternative sites should be selected.

The land capability classification is IIw. No woodland ordination symbol is assigned.

FdA—Fincastle silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on till plains. Areas are irregularly shaped and are 3 to 200 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled silt loam about 6 inches thick. The subsoil is about 41 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam, and the lower part is loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In places the lower part of the subsoil is stratified loamy sand, sandy loam, silt loam, and loam. In a few places the content of gravel is as much as 15 percent in the lower part of the subsoil. In some areas the depth to firm till is more than 60 inches, and in a few areas it is less than 40 inches.

Included with this soil in mapping are the poorly drained Cyclone soils in depressions and small areas of the well drained Miami soils on the higher rises. Included soils make up about 15 percent of the map unit.

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

Most areas are drained by subsurface drains and open ditches and are used for corn, soybeans, or small grain. Some are used for hay or pasture. A few are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

Pasture grasses and legumes can be grown in some undrained areas, but a drainage system generally is beneficial. Overgrazing and grazing when the soil is wet are the main management concerns. They result in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing minimize surface compaction and help to maintain good tilth.

This soil is well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow permeability. Perimeter interceptor subsurface drains help to lower the water table. Filling or mounding improves the ability of the field to absorb the effluent.

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

FdB—Fincastle silt loam, 2 to 4 percent slopes. This gently sloping, deep, somewhat poorly drained soil is on rises and side slopes on till plains. Areas are irregularly shaped and are 3 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 39 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam, and the lower part is clay loam and loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In a few places the content of gravel is as much as 15 percent in the lower part of the subsoil. In a few areas the upper part of the subsoil is not mottled. In places the lower part of the subsoil and the underlying material are stratified.

Included with this soil in mapping are the poorly drained Cyclone soils in drainageways and the well drained Miami soils on rises. Also included are a few areas of severely eroded soils that have a surface layer of yellowish brown silty clay loam. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the upper part of the Fincastle soil and moderately slow in the underlying material. Available water capacity is high. The water table is at a depth of 1 to 3 feet during the winter and early spring. Surface runoff is medium. Organic matter content is moderately low 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 corn, soybeans, or small grain. Some are used for hay or pasture. A few are wooded.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. Wetness is a limitation in most areas. Terraces, grassed waterways, and cropping systems that include grasses and legumes help to control erosion. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. A subsurface drainage system is needed in some of the swales and drainageways.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. A subsurface drainage system may be needed. Overgrazing and grazing when the soil is wet are the main management concerns. They result in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. Perimeter subsurface drains help to overcome this limitation. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow permeability. Perimeter interceptor subsurface drains reduce the wetness. Filling or mounding improves the ability of the field to absorb the effluent.

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

FgB2—Fincastle-Miami silt loams, 2 to 6 percent slopes, eroded. These gently sloping, deep soils are on till plains and on slopes adjacent to drainageways. The somewhat poorly drained Fincastle soil is on the broader ridgetops, on foot slopes, and along drainageways. The well drained Miami soil is on knolls and narrow ridgetops. Areas are irregularly shaped and are 3 to 140 acres in size. They are about 55 percent Fincastle soil and 35 percent Miami soil. The two soils occur as areas so intricately mixed or so small that mapping them separately was not practical.

In a typical profile of the Fincastle soil, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 39 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam, and the lower part is clay loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some places the lower part of the subsoil is stratified silt loam, sandy loam, loamy sand, and sand. In a few places the solum is less than 40 inches thick.

In a typical profile of the Miami soil, the surface layer is brown silt loam about 9 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay loam about 27 inches thick. The underlying material to a depth of about 60 inches is brown loam. In places, the lower part of the subsoil is sandy loam or gravelly sandy loam and the depth to glacial till is more than 40 inches. In a few places the surface layer is loam. In some areas mottles are at a depth of about 20 inches.

Included with these soils in mapping are the poorly drained Cyclone and very poorly drained Treaty soils in drainageways. Also included are areas of severely eroded soils that have a surface layer of clay loam or silty clay loam. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Fincastle and Miami soils and moderately slow in the underlying material. Available water capacity is high in the Fincastle soil and moderate in the Miami soil. The water table is at a depth of 1 to 3 feet during the winter and early spring in the Fincastle soil. Surface runoff is medium on both soils. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are used for corn, soybeans, or small grain. A few are used as hayland, pasture, or woodland.

If erosion is controlled, these soils are well suited to corn, soybeans, and small grain. Erosion is the main hazard. The wetness of the Fincastle soil is a limitation. Cropping systems that include grasses and legumes, terraces, diversions, and grassed waterways help to control erosion (fig. 5). A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. Subsurface drains are needed in seepy areas at the base of slopes and in drainageways. A drainage system has been established in several areas. The foot slopes are generally difficult to till in the spring because of the wetness caused by lateral seepage along the top of the firm till.

These soils are well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. A drainage system is needed in some areas. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

The Fincastle soil is severely limited as a site for dwellings because of the wetness. A drainage system helps to overcome this limitation. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow permeability. Perimeter interceptor subsurface drains reduce the wetness. Filling or mounding improves the ability of the field to absorb the effluent.

The Miami soil is moderately limited as a site for dwellings because of the shrink-swell potential. Properly designing foundations, footings, and basement walls, installing foundation drain tile, and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of the shrink-swell potential and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Because of

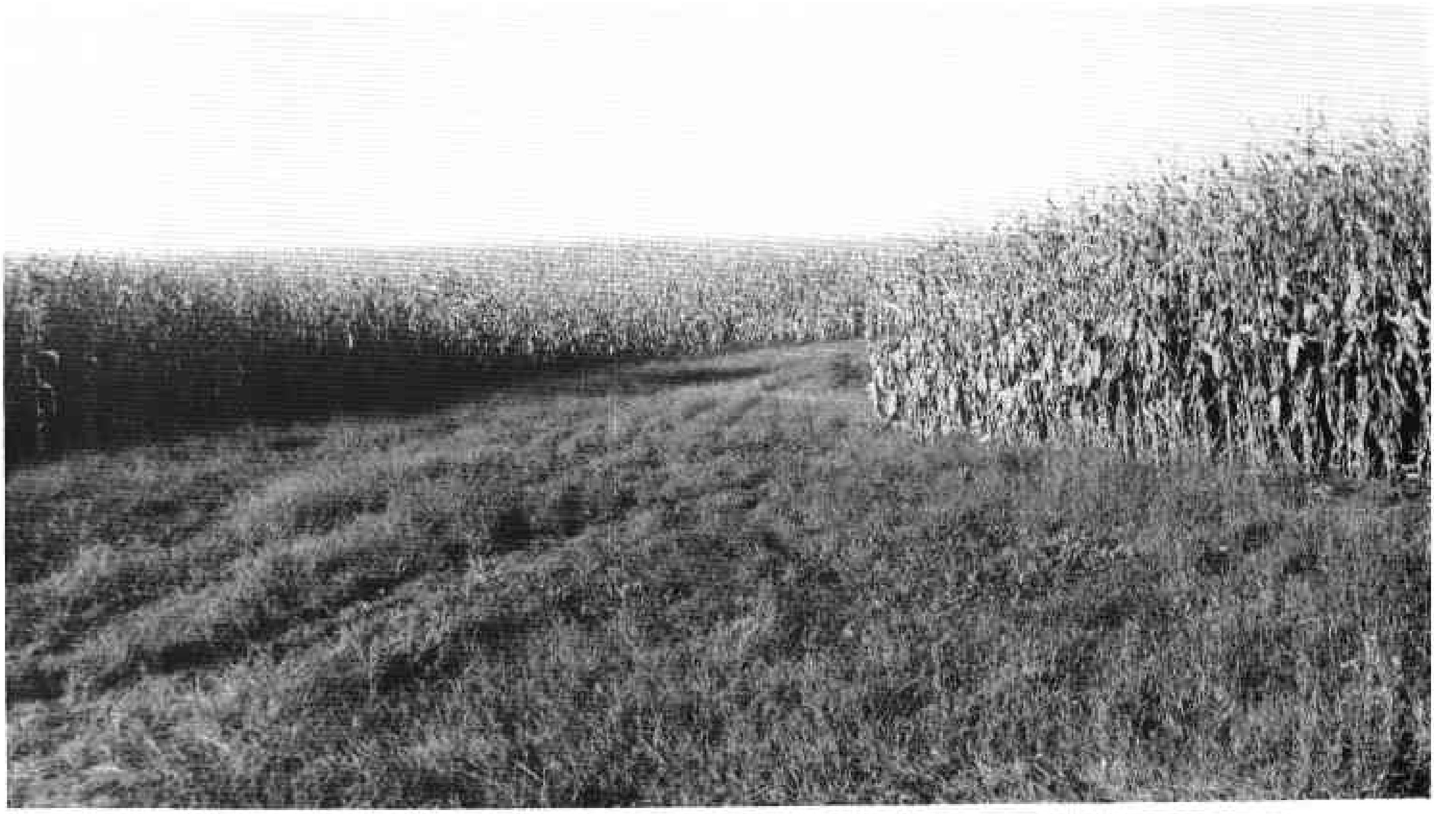


Figure 5.—A grassed waterway in an area of Fincastle-Miami silt loams, 2 to 6 percent slopes, eroded.

lateral seepage, the effluent can surface in downslope areas. As a result, curtain drains are needed in upslope areas. Filling or mounding improves the ability of the field to absorb the effluent.

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

HeF—Hennepin silt loam, 18 to 50 percent slopes. This moderately steep to very steep, deep, well drained soil is on breaks along flood plains and on the sides of draws, which extend into till plains. Slopes dominantly are 35 to 50 percent and are 100 to 200 feet long. Areas are 5 to 80 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsoil is 14 inches thick. The upper part is dark yellowish brown, firm silt 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 areas the solum is thicker. In other areas the soil is more silty.

Included with this soil in mapping are soils that formed in sand and gravel, such as Rodman and Casco soils; soils that have a solum that is thicker than that of the Hennepin soil and that formed in outwash and till, such as the Ockley soils that have a till substratum; soils in the southwest corner of the county that formed in clayey sediments; and areas where the soil has layers of loose sand and gravel as much as 36 inches thick. In several included areas the soil has hard chunks of sand and gravel bonded together by calcium carbonate. These chunks are as much as 3 feet in diameter. Also included are small seepy areas on side slopes below the contact point of the till and the layers of sand and gravel and several areas where slippage has occurred and no soil profile has developed. Included soils make up about 30 percent of the map unit.

Permeability is moderate or moderately slow in the upper part of the Hennepin soil and moderately slow or slow in the lower part. Available water capacity is moderate. Surface runoff is rapid or very rapid. Organic matter content is moderately low in the surface layer.

Most areas are wooded. A few are used for pasture. Because of the slope, this soil is generally unsuited to row crops, small grain, and forage crops and is poorly suited to trees. The main concerns in managing woodland are the erosion hazard and the equipment limitation. In some areas where the soil has layers of sand and gravel, slippage often destroys the root system. Special logging methods, such as yarding the logs uphill with a cable, may be needed because of the slope. Constructing logging roads, skid trails, and landings on gentle grades and removing water with water bars, culverts, and drop structures help to control erosion.

This soil is generally unsuitable as a site for dwellings, local roads and streets, and septic tank absorption fields because of the slope. An alternative site should be selected.

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

HxF—Hennepin-Rock outcrop complex, 35 to 90 percent slopes. This map unit occurs as areas of a very steep, deep, well drained Hennepin soil intermingled with areas of Rock outcrop. The unit is on breaks along flood plains and on the sides of drainageways that dissect till plains. The Hennepin soil typically is on the upper part of the breaks. Slopes are dominantly 100 to 200 feet long. Areas range from 3 to 150 acres in size. They generally are about 55 percent Hennepin soil and 35 percent Rock outcrop. The Hennepin soil and Rock outcrop occur as areas so intricately mixed or so small that mapping them separately was not practical.

In a typical profile of the Hennepin soil, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is dark yellowish brown, firm loam about 10 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam.

The Rock outcrop is dominantly very pale brown, fine grained sandstone and shale. In a few areas thin layers of limestone overlie the sandstone.

Included with this unit in mapping are small areas of the moderately well drained Birkbeck and well drained Miami and Russell soils on ridgetops and shoulder slopes. Also included are areas where the soil has thin layers of sand and gravel, seepy spots on side slopes near the contact point of the till and the layers of sand and gravel and at the contact point of the material above the bedrock, some areas where slippage has occurred and no soil profile has developed, and some areas where soil material has sloughed over the bedrock and a shallow soil has formed. Included soils make up about 10 percent of the map unit.

Permeability is moderate or moderately slow in the upper part of the Hennepin soil and moderately slow or slow in the lower part. Available water capacity is moderate. Surface runoff is very rapid. Organic matter content is moderately low in the surface layer.

Most areas of the Hennepin soil are wooded. This unit is generally unsuited to row crops and small grain and to forage crops because of the slope. The Hennepin soil is fairly well suited to trees. The main concerns in managing woodland are the erosion hazard and the equipment limitation. Special logging methods, such as yarding the logs uphill with a cable, may be needed because of the slope. Constructing logging roads, skid trails, and landings on gentle grades and removing water with water bars, culverts, and drop structures minimize erosion.

Because of the slope, the Hennepin soil is generally unsuitable as a site for dwellings, local roads, and septic tank absorption fields. An alternative site should be selected.

The land capability classification is VIIe. The woodland ordination symbol assigned to the Hennepin soil is 5R.

JaB—Jasper silt loam, till substratum, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on moraines and till plains. Areas are irregularly shaped and are 3 to 120 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 48 inches thick. The upper part is dark yellowish brown, firm silty clay loam, and the lower part is brown and strong brown, firm sandy clay loam, loam, and sandy loam. The underlying material to a depth of about 65 inches is yellowish brown fine sandy loam. In places the lower part of the subsoil is loamy sand or sand. In a few places firm glacial till is within a depth of 40 inches. In some areas the underlying material has pockets or strata of loamy sand, gravelly coarse sand, and sand. In other areas the surface layer is loam. In a few places the dark surface layer is less than 10 inches thick. In places the subsoil contains more silt and less sand to a depth of about 36 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton soils in swales and some areas of severely eroded soils that have a yellowish brown surface layer. Included soils make up 5 percent of the map unit.

Permeability is moderate in the upper part of the Jasper soil and moderately slow in the underlying material. Available water capacity is high. Runoff is medium. 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 corn, soybeans, or small grain. A few are used for hay or pasture.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by terraces, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. A cover of grasses and legumes is effective in controlling erosion. Overgrazing is the main management concern. It results in 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 suitable as a site for dwellings. If the lower part of the basement is constructed in the firm glacial till, wetness is a problem. It can be overcome by installing a subsurface drainage system around the foundation. The soil is moderately limited as a site for local roads and streets because of frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The soil is moderately limited as a site for septic tank absorption fields because of the moderate permeability. Filling or mounding improves the ability of the field to absorb the effluent.

The land capability classification is IIe. No woodland ordination symbol is assigned.

Lb—Landes Variant fine sandy loam, rarely flooded. This nearly level, deep, well drained soil is on flood plains. Areas are irregularly shaped and are 3 to 75 acres in size.

In a typical profile, the surface layer is very dark gray fine sandy loam about 8 inches thick. The subsurface layer is very dark gray fine sandy loam about 5 inches thick. The subsoil is dark yellowish brown, brown, and yellowish brown, friable loamy fine sand about 29 inches thick. The underlying material to a depth of about 60 inches is light yellowish brown sand. In some places gray mottles are within a depth of 30 inches. In other places gravelly coarse sand is below a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Ceresco and moderately well drained Beckville soils in the lower landscape positions. These soils make up about 10 percent of the map unit.

Permeability is moderately rapid in the subsoil of the Landes Variant soil and rapid in the underlying material. Available water capacity is low. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are used for corn or soybeans. Small inaccessible areas are used as pasture or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Droughtiness is a problem in dry periods. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to pasture grasses and legumes. The main management concern is overgrazing. 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 concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. The soil is moderately limited as a site for local roads and streets because of the flooding. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts minimize the damage caused by flooding.

The land capability classification is IIIs. The woodland ordination symbol is 7A.

Lo—Lobdell silt loam, rarely flooded. This nearly level, deep, moderately well drained soil is on flood plains. Areas are 3 to 55 acres in size. Most are irregularly shaped, but many are elongated and are parallel to streams.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil is brown and yellowish brown, mottled, friable and firm silt loam and loam about 34 inches thick. The underlying material to a depth of about 60 inches is dark grayish brown, mottled sandy loam. In places the surface soil is as much as 24 inches thick. In a few places carbonates are as shallow as 50 inches. In some areas the subsoil contains more clay. In a few areas sand and gravelly coarse sand are below a depth of 40 inches.

Included with this soil in mapping are the well drained Chagrin soils in the slightly higher landscape positions and the well drained Stonelick soils in the lower positions closer to the streams. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the upper part of the Lobdell soil and moderately rapid in the lower part. Available water capacity is high. Surface runoff is slow. The water table is at a depth of 2.0 to 3.5 feet during the winter and early spring. Organic matter content is moderately low 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 corn or soybeans. A few are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main management concern. A drainage system of subsurface drains and open ditches has been established in some areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, girdling, or spraying.

Because of the flooding, this soil is generally unsuitable as a site for dwellings. It is severely limited as a site for local roads because of frost action. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness. Installing perimeter interceptor subsurface drains helps to lower the water table.

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

Mb—Mahalasville silty clay loam. This nearly level, deep, very poorly drained soil is in sluiceways, depressions, and drainageways on till plains. It is frequently ponded by runoff from the adjacent soils. Areas are 3 to 300 acres in size. They generally are irregularly shaped, but some are oval and those in sluiceways are generally elongated.

In a typical profile, the surface layer is very dark gray silty clay loam about 10 inches thick. The subsurface layer is black silty clay loam about 5 inches thick. The subsoil is about 37 inches thick. The upper part is gray and grayish brown, mottled, firm silty clay loam, and the lower part is light brownish gray and grayish brown, mottled, firm silt loam and loam. The underlying material to a depth of about 60 inches is gray and yellowish brown, stratified sandy loam, loam, silt loam, and gravelly sand. In a few places sand is at a depth of about 30 inches. In a few areas, the underlying material occurs as a thin layer and firm glacial till is as shallow as 50 inches. In some places light colored overwash covers the dark surface layer. In other places the silty material is more than 60 inches thick. In a few areas the surface layer and subsoil contain more sand and less silt.

Included with this soil in mapping are small areas of the somewhat poorly drained Starks and Crosby soils on slight rises. Also included, in the sluiceways, are some areas that are subject to rare flooding. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Mahalasville soil and moderately rapid in the underlying material. Available water capacity is high. The water table is near or above the surface during the winter and early spring. Surface runoff is very slow or ponded. Organic matter content is high in the surface layer. This layer can be tilled only within a narrow range in moisture content.

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A drainage system of subsurface drains, surface drains, open ditches, or a combination of these has been established in most areas. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets (fig. 6). A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. The soil is well suited to fall plowing.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is

Figure 6.—An open ditch in an area of Mahalasville silty clay loam. In most areas riprap is needed to stabilize the ditchbanks.

too wet are the main management concerns. They result in 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. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are the management concerns. Equipment should be used only during dry periods or when the ground is frozen. Species that can withstand the wetness should be favored in the stands. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and for septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding, low strength, and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The base should be strengthened with suitable material.

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

Mc—Mahalasville silty clay loam, gravelly substratum. This nearly level, deep, very poorly drained soil is on outwash plains and terraces. It is frequently ponded by runoff from the adjacent soils. Areas are 3 to 600 acres in size. They generally are irregularly shaped, but many are elongated.

In a typical profile, the surface layer is black, firm silty clay loam about 11 inches thick. The subsoil is about 46 inches thick. The upper part is gray and grayish brown, mottled, firm silty clay loam, and the lower part is gray, mottled, firm loam and silt loam. The underlying material to a depth of about 65 inches is brown gravelly coarse sand. In some areas, the soil has thick strata of sand and silt and the depth to loose sand and gravel is more than 80 inches. In a few places the depth to firm glacial till is less than 70 inches. In places the silty material is as much as 60 inches thick. In a few areas the subsoil contains more sand and less silt.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby and Starks soils on slight rises. These soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Mahalasville soil and rapid in the underlying material. Available water capacity is high. The water table is near or above the surface during the winter and early spring. Surface runoff is ponded or very slow. Organic matter content is high in the surface layer. This layer can be tilled only within a narrow range in moisture content.

Nearly all areas of this soil are drained and are used for corn, soybeans, or small grain. A few are used for hay or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A drainage system of subsurface drains, surface drains, open ditches, or a combination of these has been established in most areas. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. The soil is well suited to fall plowing.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in 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. 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. Species that can withstand the wetness should be favored in the stands. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding, low strength, and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The base should be strengthened with suitable material.

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

MdD2—Martinsville-Ockley loams, till substrata, 12 to 18 percent slopes, eroded. These strongly sloping, deep, well drained soils are on moraines and till plains. Areas are irregularly shaped and are 3 to 45 acres in size. They are about 50 percent Martinsville soil and 40 percent Ockley soil. The two soils occur as areas so intricately mixed that mapping them separately was not practical.

In a typical profile of the Martinsville soil, the surface layer is brown loam about 6 inches thick. The subsoil is about 45 inches thick. The upper part is brown, firm clay loam; the next part is strong brown, firm clay loam and sandy clay loam; and the lower part is brown and dark brown, firm sandy loam. The underlying material to a depth of about 60 inches is brown loam. In places the lower part of the subsoil is stratified silt loam, loamy sand, and fine sand. In a few places the depth to firm glacial till is less than 30 inches.

In a typical profile of the Ockley soil, the surface layer is grayish brown loam about 5 inches thick. The subsoil is about 48 inches thick. In sequence downward, it is brown, firm clay loam; very dark brown, firm gravelly clay loam; strong brown, firm gravelly sandy clay loam; and yellowish red and strong brown, firm gravelly sandy loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In places a thin layer of calcareous sand and gravel or reddish brown gravelly loamy sand is directly above the underlying material. In a few places the underlying material is gravelly loam, gravelly sandy loam, gravelly sand, or sandy loam. In a few areas firm glacial till is within a depth 30 inches.

Included with these soils in mapping are the somewhat poorly drained Starks and very poorly drained Mahalasville soils. Starks soils are on foot slopes and in drainageways. Mahalasville soils are in depressions and drainageways. Also included are areas of severely eroded soils that have a surface layer of clay loam. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Martinsville and Ockley soils. Available water capacity is moderate or high. Surface runoff is rapid. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are used for hay, pasture, or woodland. Some are used for small grain, corn, or soybeans.

Because of the erosion hazard, these soils are poorly suited to corn, soybeans, and wheat. Erosion is the main management concern (fig. 7). It can be controlled by a crop rotation that includes grasses and legumes and by terraces, diversions, and grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content.

These soils are fairly well suited to grasses and legumes, such as orchardgrass and alfalfa. Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the slope, these soils are severely limited as sites for dwellings and for septic tank absorption fields. Land shaping, installing retaining walls, and designing the buildings so that they conform to the natural slope of the land help to overcome this limitation on sites for dwellings. An alternative site should be selected for septic tank absorption fields. The soils are severely limited as sites for local roads and streets because of the slope of both soils and low strength in the Martinsville soil. Constructing the roads on the contour and land shaping help to overcome the slope. The base should be strengthened with suitable material.

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

MeB—Martinsville-Ockley silt loams, till substrata, 2 to 6 percent slopes. These gently sloping, deep, well drained soils are on rises on moraines and till plains. Areas are irregularly shaped and are 3 to 150 acres in size. They are about 50 percent Martinsville soil and 40 percent Ockley soil. The two soils occur as areas so intricately mixed that mapping them separately was not practical.

In a typical profile of the Martinsville soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 46 inches thick. In sequence downward, it is dark yellowish brown, firm silt loam; brown, firm clay loam and sandy clay loam; dark yellowish brown, firm coarse sandy loam; and strong brown, friable loamy coarse sand. The underlying material to a depth of about 65 inches is yellowish brown fine sandy loam. In some

Figure 7.—Soybeans in an area of Martinsville-Ockley loams, till substrata, 12 to 18 percent slopes, eroded. Erosion has resulted in a lighter colored surface layer.

places the lower part of the subsoil and the underlying material are stratified silt loam, sand, and fine sand and have a few pockets of gravelly material. In other places the silty material is as much as 35 inches thick. In a few places firm glacial till is within a depth of 35 inches. In some areas the lower part of the subsoil has a 3- to 10-inch layer that formed in glacial till. In a few areas gray mottles are as shallow as 30 inches.

In a typical profile of the Ockley soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 48 inches thick. The upper part is dark yellowish brown, firm clay loam; the next part is brown, firm sandy clay loam; and the lower part is brown, firm gravelly sandy clay loam and gravelly sandy loam. The underlying material to a depth of about 65 inches is yellowish brown fine sandy loam (fig. 8). In places a thin layer of brown or reddish brown, calcareous sand and gravel, gravelly loamy sand, or loamy sand is above the firm glacial till. In a few places the underlying material is gravelly loam, gravelly sandy loam, or sandy loam. In a few areas firm glacial till is within a depth of 35 inches. In a few places gray mottles are within a depth of 30 inches.

Included with these soils in mapping are the somewhat poorly drained Fincastle, very poorly drained Mahalasville, and somewhat poorly drained Starks soils. Fincastle and Starks soils are on foot slopes and in drainageways. Mahalasville soils are in drainageways. Also included are areas of severely eroded soils that have a surface layer of clay loam. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Martinsville and Ockley soils. Available water capacity is moderate or high. Surface runoff is medium. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are used for corn, soybeans, or wheat. A few are used for hay, pasture, or woodland.

If erosion is controlled, these soils are suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes and by terraces, diversions, or grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soils are well suited to no-till farming.

These soils are well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

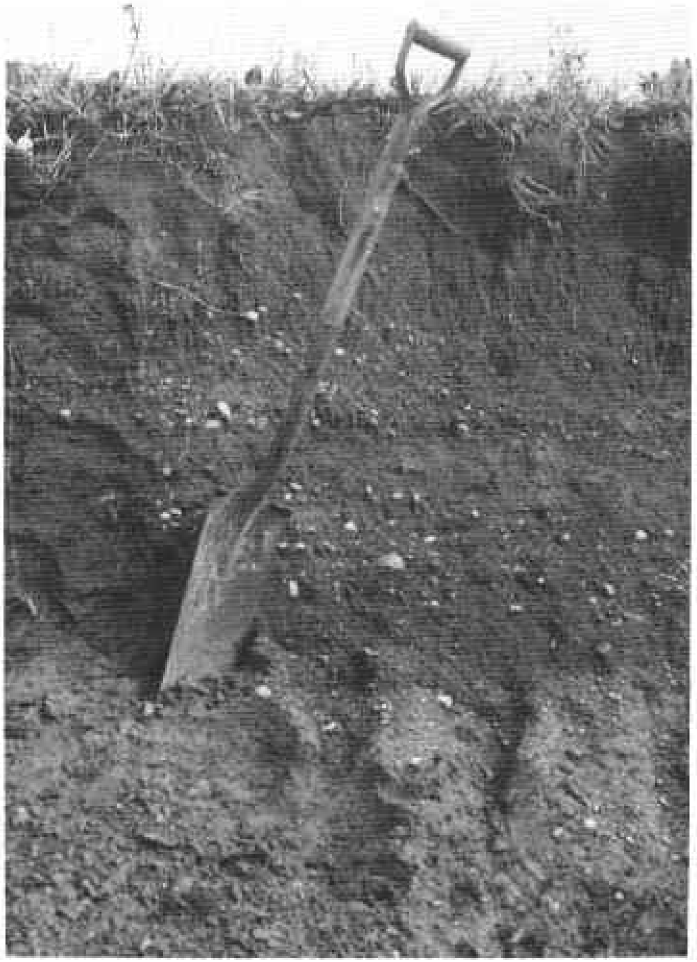


Figure 8.—Profile of the Ockley soil in the map unit Martinsville-Ockley silt loams, till substrata, 2 to 6 percent slopes. The spade marks the contact point between glaciofluvial material and the underlying firm glacial till.

Because of the shrink-swell potential, these soils are moderately limited as sites for dwellings. Properly designing foundations and basement walls helps to prevent the structural damage caused by shrinking and swelling. If the lower part of the basement is constructed in the firm glacial till, wetness is a problem. It can be overcome by installing perimeter interceptor subsurface drains.

The Martinsville soil is moderately limited as a site for local roads and streets because of low strength, and the Ockley soil is moderately limited because of frost action and the shrink-swell potential. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

These soils are moderately limited as sites for septic tank absorption fields because of the moderate permeability. Lateral seepage may be a problem in areas where firm glacial till is within a depth of 50 inches. Enlarging the absorption field helps to overcome the restricted permeability.

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

MeC—Martinsville-Ockley silt loams, till substrata, 6 to 12 percent slopes. These moderately sloping, deep, well drained soils are on ridges and knobs on moraines and till plains. Areas are irregularly shaped and are 3 to 55 acres in size. They are about 50 percent Martinsville soil and 40 percent Ockley soil. The two soils occur as areas so intricately mixed that mapping them separately was not practical.

In a typical profile of the Martinsville soil, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 48 inches thick. The upper part is dark brown and dark yellowish brown, firm clay loam, and the lower part is yellowish brown, firm sandy loam. The underlying material to a depth of about 60 inches is light olive brown loam. In a few places the lower part of the subsoil is stratified silt loam, sand, and fine sand and has a few pockets of gravelly material. In a few areas firm glacial till is within a depth of 35 inches.

In a typical profile of the Ockley soil, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 43 inches thick. In sequence downward, it is strong brown, firm loam; strong brown and reddish brown, firm clay loam and sandy clay loam; strong brown, firm gravelly sandy clay loam; and brown, friable sandy loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In some areas a thin layer of calcareous gravelly coarse sand, gravelly loamy sand, or loamy sand is directly above the underlying material. In several places the underlying material is gravelly loam, gravelly sandy loam, or sandy loam. In a few areas firm glacial till is within a depth of 30 inches. In a few places the silty material is as much as 35 inches thick.

Included with these soils in mapping are the very poorly drained Mahalasville and somewhat poorly drained Fincastle and Starks soils. Fincastle and Starks soils are on foot slopes and in drainageways. Mahalasville soils are in depressions and drainageways. Also included are areas of severely eroded soils that have a surface layer of clay loam. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Martinsville and Ockley soils. Available water capacity is moderate or high. Surface runoff is medium. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas are used for corn, soybeans, or wheat. Some are used for hay, pasture, or woodland.

If erosion is controlled, these soils are fairly well suited to corn, soybeans, and small grain. Erosion is the main management concern. It can be controlled by cropping systems that include grasses and legumes and by terraces, diversions, and grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soils are well suited to no-till farming.

These soils are well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential and the slope, these soils are moderately limited as sites for dwellings. Properly designing foundations and basement walls helps to prevent the structural damage caused by shrinking and swelling. If the lower part of the basement is constructed in the firm glacial till, wetness is a problem. It can be overcome by installing perimeter interceptor subsurface drains. The buildings should be constructed in the less sloping areas or designed so that they conform to the natural slope of the land.

The Martinsville soil is severely limited as a site for local roads and streets because of low strength, and the Ockley soil is moderately limited because of the slope, the shrink-swell potential, and frost action. The base should be strengthened with suitable material. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action.

These soils are moderately limited as sites for septic tank absorption fields because of the slope and the moderate permeability. Lateral seepage may be a problem in areas where the depth to compact glacial till is less than 50 inches. Enlarging the absorption field helps to overcome the restricted permeability.

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

MoC2—Miami silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on knobs and side slopes on till plains. Areas are irregularly shaped and are 3 to 45 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 8 inches thick. The subsoil is yellowish brown and brown, firm clay loam about 18 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In some areas the solum is more than 40 inches thick. In other areas the lower part of the subsoil is mottled. In places the subsoil is sandy loam or sandy clay loam. In a few places the silty material is as much as 30 inches thick. In some areas the underlying material is sandy loam.

Included with this soil in mapping are the somewhat poorly drained Crosby and Fincastle soils. These soils are in the slightly lower landscape positions. Also included are areas of severely eroded soils that have more clay in the surface layer than the Miami soil and that have a thinner solum. Included soils make up 10 percent of the map unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the underlying material. Available water capacity is moderate. Surface runoff is rapid. Organic matter content is moderately low in the surface layer. This layer can be tilled only within a narrow range in moisture content.

Most areas of this soil are used for corn, soybeans, or small grain. Some are used for hay or pasture.

If erosion is controlled, this soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main management concern (fig. 9). It can be controlled by cropping systems that include grasses and legumes, by terraces, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the slope and the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls and installing foundation drains help to prevent the structural damage caused by shrinking and swelling. Leaving as much of the existing vegetation on the site as possible and building on random lots help to control erosion. The buildings should be designed so that they conform to the natural slope of the land.

This soil is moderately limited as a site for local roads and streets because of the slope, the shrink-swell

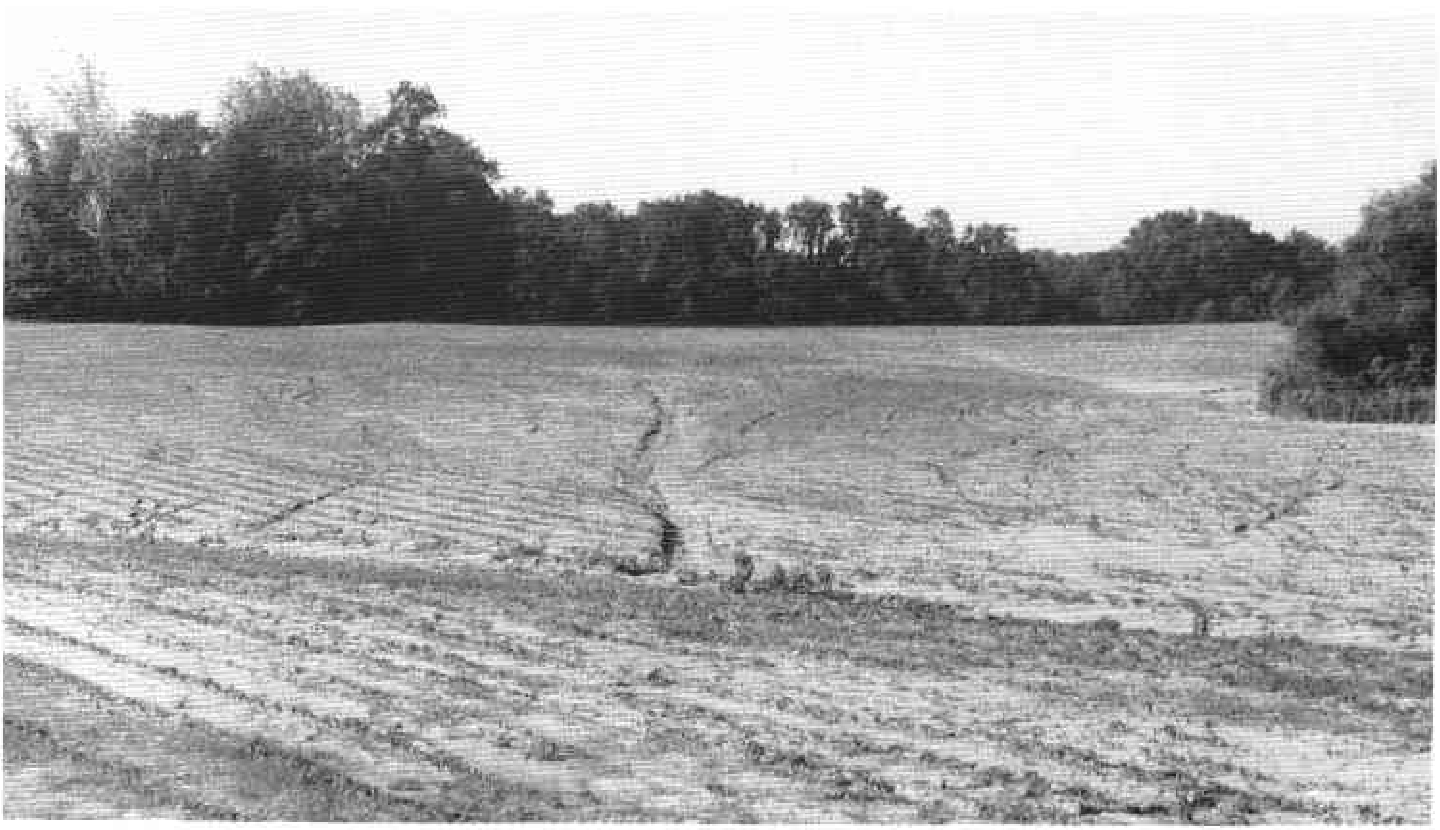


Figure 9.—Gully and rill erosion in an unprotected area of Miami silt loam, 6 to 12 percent slopes, eroded.

potential, and frost action. The roads should be built on the contour. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Lateral seepage along the top of the firm till is common, and the effluent can travel several feet before surfacing. Installing curtain drains in upslope areas helps to control the lateral flow.

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

MoE2—Miami silt loam, 15 to 25 percent slopes, eroded. This strongly sloping and moderately steep, deep, well drained soil is on the sides of draws on till plains. Slopes are dominantly 70 to 150 feet long. Areas are 5 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 19 inches of dark yellowish brown and yellowish brown, firm clay loam and loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In places the silty material is as much as 30 inches thick. In a few places the lower part of the subsoil is mottled. In a few areas the subsoil is thinner and contains less clay. In places the silty material is as much as 35 inches thick.

Included with this soil in mapping are the somewhat poorly drained Crosby and Fincastle soils on ridgetops. Also included are areas of severely eroded soils that have more clay in the surface layer than the Miami soil and, at the upper end of drainageways, some areas that have a slope of less than 15 percent. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the underlying material. Available water capacity is moderate. Surface runoff is rapid. Organic matter content is moderately low in the surface layer.

Nearly all areas are wooded or pastured. Much of the woodland supports young trees and brush. A few areas are used for corn or soybeans. These areas are included in large fields where the soils generally are less sloping than this soil.

Because of the slope and the erosion hazard, this soil is generally unsuited to corn, soybeans, and small grain. It is poorly suited to grasses and legumes for hay and pasture because of the slope. Overgrazing is the main management concern. It results in 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 main management concerns are the erosion hazard, the equipment limitation, and plant competition. Constructing logging roads, skid trails, and landings on gentle grades and removing water with water bars, culverts, and drop structures help to control erosion. Competing vegetation can be controlled by cutting, spraying, or girdling. Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. The use of such equipment can be minimized by special logging methods, such as yarding the logs uphill with a cable.

Because of the slope, this soil is severely limited as a site for dwellings and for local roads and streets. Dwellings should be designed so that they conform to the natural slope of the land. Roads and streets should be constructed on the contour. Cutting and filling generally are needed. The soil is generally unsuitable as a site for septic tank absorption fields because of the slope and the moderately slow permeability. Alternative sites should be selected.

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

MpC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on rises and breaks on till plains. Areas are elongated or irregularly shaped and are 3 to 25 acres in size.

In a typical profile, the surface layer is brown clay loam about 8 inches thick. The subsoil is dark yellowish brown and brown, firm clay loam about 18 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the lower part of the subsoil is gravelly clay loam, loamy sand, or sand. In other places the solum is more than 40 inches thick. In a few places the surface layer is calcareous loam. In some areas the surface layer is gravelly. In a few areas the underlying material is sandy loam and is more friable.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby and Fincastle soils on toe slopes and in drainageways. Also included are small seepy areas on toe slopes. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the underlying material. Available water capacity is moderate. Surface runoff is medium. Organic matter content is low in the surface layer. This layer can be tilled only within a very narrow range in moisture content.

Most areas of this soil are used for corn, soybeans, or small grain. Some are used for hay or pasture.

Because of the severely eroded surface layer and the hazard of further erosion, this soil is poorly suited to corn and soybeans. It is fairly well suited to small grain. In some areas small gullies have formed. Farm machinery cannot easily cross these areas. Poor tilth is a limitation. Erosion can be controlled by cropping systems that include grasses and legumes, by terraces, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content.

This soil is fairly well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the slope and the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. Leaving as much of the existing vegetation on the site as possible and building on random lots help to control erosion. The buildings should be designed so that they conform to the natural slope of the land.

This soil is moderately limited as a site for local roads and streets because of the slope, frost action, and the shrink-swell potential. The road should be built on the contour. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

Because of the moderately slow permeability, this soil is severely limited as a site for septic tank absorption fields. Lateral seepage along the top of the firm till is common, and the effluent can travel several feet before surfacing. Installing curtain drains in upslope areas helps to control the lateral flow. Filling or mounding improves the ability of the field to absorb the effluent.

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

MpD3—Miami clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on moraines and breaks on till plains. Areas are elongated or irregularly shaped and are 3 to 25 acres in size.

In a typical profile, the surface layer is dark yellowish brown clay loam about 7 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay loam and loam about 17 inches thick. The underlying material to a depth of about 60 inches is brown loam. In some places the lower part of the subsoil is gravelly sandy clay loam. In other places thin layers of loamy sand or sand are directly above the underlying till. In a few places the solum is more than 40 inches thick. In a few areas the surface layer is calcareous loam. In some areas the surface layer is gravelly. In a few places the underlying material is sandy loam and is more friable.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby and Fincastle soils on toe slopes and in drainageways. Also included are small seepy areas on toe slopes. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the underlying material. Available water capacity is moderate. Surface runoff is very rapid. Organic matter content is low in the surface layer. This layer can be tilled only within a very narrow range in moisture content.

Most areas are used for corn, soybeans, or small grain. Some are used for hay or pasture. A few support stands of young trees. Because of the severely eroded surface layer and the hazard of further erosion, this soil is generally unsuited to corn and soybeans. In some areas small gullies have formed. Farm machinery cannot easily cross these areas.

Because of the slope and the hazard of erosion, this soil is poorly suited to grasses and legumes for hay and pasture. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the slope, this soil is severely limited as a site for dwellings and for local roads and streets. Leaving as much of the existing vegetation on the site as possible and reseeding or sodding exposed areas as soon as possible after construction help to control erosion on building sites. The buildings should be designed so that they conform to the natural slope of the land. Local roads and streets should be built on the contour. The base should be strengthened with suitable material. The soil is generally unsuitable as a site for septic tank absorption fields because of the slope and the moderately slow permeability. Lateral seepage is common, and the effluent can travel several feet before surfacing. Alternative sites should be selected.

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

MrC2—Miami-Xenia silt loams, 4 to 10 percent slopes, eroded. These moderately sloping, deep soils are on rises and on breaks along drainageways on till plains. The well drained Miami soil is typically on the more sloping back and shoulder slopes, and the moderately well drained Xenia soil is on the less sloping foot slopes and summits. Areas are irregularly shaped and are 3 to 45 acres in size. They are about 50 percent Miami soil and 45 percent Xenia soil. The two soils occur as areas so intricately mixed or so small that mapping them separately was not practical.

In a typical profile of the Miami soil, the surface layer is brown silt loam about 5 inches thick. The subsoil is yellowish brown, firm clay loam about 19 inches thick. The underlying material to a depth of about 60 inches is brown, firm loam. In some places the depth to firm glacial till is less than 24 inches. In other places the content of gravel is as much as 10 percent in the surface layer.

In a typical profile of the Xenia soil, the surface layer is dark yellowish brown silt loam about 10 inches thick. The subsoil is about 40 inches thick. The upper part is dark yellowish brown, mottled, firm silty clay loam, and the lower part is brown, mottled, firm clay loam. The underlying material to a depth of about 60 inches is brown loam. In a few places the lower part of the subsoil has strata of sandy loam.

Included with these soils in mapping are the somewhat poorly drained Reesville and Fincastle soils on the less sloping summits and toe slopes and the moderately well drained Birkbeck soils on ridgetops and along drainageways. Birkbeck soils have a layer of loess that is thicker than that of the Miami and Xenia soils. Also included are areas of severely eroded soils and small areas of the somewhat poorly drained Shoals soils in drainageways. The severely eroded soils have more clay in the surface layer than the Miami and Xenia soils. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the underlying material. It is moderately slow in the Xenia soil. Available water capacity is moderate in the Miami soil and high in the Xenia soil. The water table is at a depth of 2 to 6 feet in the Xenia soil during early spring. Surface runoff is medium on both soils. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are used for corn, soybeans, or wheat. Several are used as hayland or pasture. In a few areas brush and young trees are the dominant vegetation.

If erosion is controlled, these soils are fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. A subsurface drainage system is needed in some of the less sloping drainageways.

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

The Miami soil is moderately limited as a site for dwellings because of the slope and the shrink-swell potential. The Xenia soil is moderately limited as a site for dwellings without basements because of the wetness, the slope, and the shrink-swell potential and is severely limited as a site for dwellings with basements because of the wetness. Installing perimeter interceptor drain tile around foundations helps to overcome the wetness. Strengthening foundations, footings, and basement walls helps to prevent the damage caused by shrinking and swelling. Dwellings with basements should not be constructed on the Xenia soil. Land shaping, installing retaining walls, and designing the buildings so that they conform to the natural slope of the land help to overcome the slope.

The Miami soil is moderately limited as a site for local roads and streets because of the slope, low strength, and frost action, and the Xenia soil is severely limited because of low strength and frost action. Constructing the roads on compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The roads should be constructed on the contour.

The Xenia soil is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow permeability, and the Miami soil is severely limited because of the moderately slow permeability. Lateral seepage along the top of the firm till is common, and the effluent can travel several feet before surfacing. Installing curtain drains in upslope areas reduces the wetness and the hazard of seepage. Filling or mounding improves the ability of the field to absorb the effluent.

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

Ms—Milford silty clay loam, pothole. This nearly level, deep, very poorly drained soil is in potholes on till plains and outwash plains. It is frequently ponded by runoff from the adjacent soils. Areas are oval and are 2 to 15 acres in size.

In a typical profile, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is very dark gray silty clay about 5 inches thick. The subsoil is very dark gray, dark gray, and gray, mottled, firm silty clay about 34 inches thick. The underlying material to a depth of about 60 inches is gray, mottled silt loam. In some places the surface layer is slightly lighter in color and contains less clay. In other places the subsoil is dark brown. In a few places it is organic. In some areas the underlying material has thin layers of marl. In other areas the subsoil contains less clay and more silt.

Included with this soil in mapping are the poorly drained Cyclone soils around the edge of the mapped areas and the somewhat poorly drained Fincastle and Starks soils on slight rises. Cyclone soils have less clay in the subsoil than the Milford soil. Also included are some areas that are ponded most of the year. Included soils make up about 10 percent of the map unit.

Permeability is moderately slow in the Milford soil. Available water capacity is high. The water table is near or above the surface during the winter and spring. Surface runoff is ponded or very slow. Organic matter content is high in the surface layer. This layer can be tilled only within a very narrow range in moisture content. In areas where overwash has accumulated, however, the surface layer can be tilled throughout a somewhat wider range in moisture content.

Many areas of this soil are left idle because of the wetness. Some are drained by subsurface drains, open ditches, surface drains, or a combination of these. These areas are used for corn or soybeans. The crops are usually damaged to some extent by the ponding. Because of the slow permeability in the subsoil, subsurface drains do not always work satisfactorily. Suitable outlets for these drains are difficult to locate because the soil is in low lying potholes. Surface inlets are needed in most areas, so that the surface water can move to the subsurface drains. Surface drains are beneficial. In many areas, however, the grade is insufficient for outlets.

Because of the wetness, this soil is poorly suited to corn and soybeans. Because of the ponding in winter and spring, it is unsuited to small grain even if an adequate drainage system has been established for row crops. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. The soil is well suited to fall plowing.

Because of the ponding, this soil is poorly suited to pasture grasses and legumes. Overgrazing and grazing when the soil is wet are the main management concerns. It results in 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 generally unsuitable as a site for dwellings because of the ponding and as a site for septic tank absorption fields because of the ponding and the moderately slow permeability. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding, frost action, and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The base should be strengthened with suitable material.

The land capability classification is IVw. No woodland ordination symbol is assigned.

Mt—Milford Variant mucky silty clay. This nearly level, deep, very poorly drained soil is in potholes on till plains and outwash plains. It is subject to ponding by runoff from the adjacent soils. Areas are irregularly shaped and are 3 to 100 acres in size.

In a typical profile, the surface layer is black mucky silty clay about 11 inches thick. The subsurface layer also is black mucky silty clay. It is about 6 inches thick. The subsoil is olive gray, mottled, firm silty clay about 9 inches thick. The underlying material to a depth of about 60 inches is gray, mottled silt loam. In a few places the underlying material has thin layers of very fine sand, marl, and snail shells. In a few areas the surface layer is lighter colored and contains carbonates. In a few places it is muck or silty clay loam.

Included with this soil in mapping are the very poorly drained Mahalasville soils in slightly higher landscape positions around the edge of the mapped areas. Included soils make up about 5 to 10 percent of the map unit.

Permeability is slow in the upper part of the Milford Variant soil and very slow in the lower part. Available water capacity is high. The water table is near or above the surface in the winter and early spring. Surface runoff is slow. Organic matter content is very high in the surface layer. This layer can be tilled only within a narrow range in moisture content.

Many areas of this soil are left idle because of the wetness. Some are drained by subsurface drains, open ditches, surface drains, or a combination of these. These areas are used for corn or soybeans. The crops are usually damaged to some extent by the ponding. Subsurface drains do not always work satisfactorily. Suitable outlets for these drains commonly are difficult to locate because the soil is in low lying potholes. Surface inlets are needed in most areas, so that the surface water can move to the subsurface drains. Surface drains are beneficial. In many areas, however, the grade is insufficient for outlets.

Because of the wetness, this soil is poorly suited to corn and soybeans. Because of the ponding in winter and spring, it is unsuited to small grain even if an adequate drainage system has been established for row crops. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. The soil is well suited to fall plowing.

Because of the ponding, this soil is poorly suited to pasture grasses and legumes. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding, frost action, and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The base should be strengthened with suitable material.

The land capability classification is IVw. No woodland ordination symbol is assigned.

MuA—Millbrook silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 40 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 37 inches thick. The upper part is brown, mottled, firm silty clay loam; the next part is grayish brown, mottled, firm silty clay and silty clay loam; and the lower part is yellowish brown, mottled, firm and friable silt loam and loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled silt loam that has thin lenses of very fine sand. In a few places the silty material is less than 24 inches thick. In places the surface layer is lighter colored. In a few areas glacial till is at a depth of 40 to 60 inches. In some areas the dark surface layer is thicker.

Included with this soil in mapping are small areas of the poorly drained Drummer soils in depressions and the moderately well drained and well drained Proctor soils on rises and knobs. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the Millbrook soil. Available water capacity is high. The water table is at a depth of 1 to 3 feet in the winter and early spring. Surface runoff is slow. 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 drained by open ditches and subsurface drains and are used for corn, soybeans, or small grain. A few are used as hayland or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, girdling, or spraying.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. The buildings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The soil is severely limited as a site for septic tank absorption fields because of the wetness. Perimeter interceptor subsurface drains lower the water table and help to remove excess water.

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

MvA—Millbrook Variant silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on rises on broad outwash plains. Areas are irregularly shaped and are 3 to 40 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 49 inches thick. The upper part is yellowish brown, mottled, firm silty clay loam; the next part is grayish brown, mottled, firm sandy clay loam; and the lower part is gray, mottled, firm gravelly sandy clay loam and gravelly coarse sandy loam. The underlying material to a depth of about 65 inches is gray, loose gravelly coarse sand. In places the silty material is less than 24 inches thick. In a few places firm glacial till is at a depth of 50 to 80 inches. In a few areas the surface layer is lighter colored. In some areas the dark surface layer is as much as 12 inches thick.

Included with this soil in mapping are the very poorly drained Mahalasville soils in depressions and the moderately well drained Bowes Variant soils on rises. Mahalasville soils have a gravelly substratum. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Millbrook Variant soil and rapid in the underlying material. Available water capacity is high. The water table is at a depth of 1 to 3 feet in the winter and early spring. Surface runoff is slow. 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 drained by open ditches and subsurface drains and are used for corn, soybeans, or small grain. A few are used as hayland or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness. Perimeter interceptor subsurface drains help to lower the water table.

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

Mw—Muskego muck, drained. This nearly level, deep, very poorly drained soil is in depressions on till plains. It is subject to ponding by runoff from the adjacent soils. Areas are oval or irregularly shaped and are 5 to 300 acres in size.

In a typical profile, the surface layer is black muck about 11 inches thick. The next layer is dark reddish brown, friable muck about 15 inches thick. Below this to a depth of about 60 inches is very dark grayish brown, very dark gray, and olive gray, firm coprogenous earth. In a few places fire has consumed much of the organic material. In a few areas, the layer of organic material is thin and the coprogenous earth is being incorporated into the surface layer. In some places snail shells are common in the coprogenous earth. In other places the coprogenous earth has thin strata of fine sand, marl, or both. In some areas the organic material is more than 51 inches thick. In other areas loamy material rather than coprogenous material underlies the organic material.

Included with this soil in mapping are small areas of the very poorly drained Milford and Milford Variant soils. These soils formed in mineral material. They are in the slightly higher landscape positions, commonly at the edge of the mapped areas. Included soils make up about 10 percent of the map unit.

Permeability is moderate or moderately rapid in the organic part of the Muskego soil and slow in the underlying coprogenous earth. Surface runoff is ponded. The water table is commonly near or above the surface in the winter and spring. Available water capacity is high. Organic matter content is very high in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are drained. Corn is the dominant crop, but soybeans are also grown. Pumps are used in conjunction with subsurface tile and open ditches. A subsurface drainage system works well if the tile is installed in the organic material rather than the coprogenous earth. A drainage system is difficult to establish and maintain because of inadequate outlets and subsidence following drainage. Lowering the water table by pumps during the growing and harvesting seasons and then allowing it to rise above the surface in the winter minimize subsidence of the organic material. Since tilth is very poor in the coprogenous earth, the overlying muck should be protected. If the soil is dry and unprotected, the organic material is susceptible to soil blowing. It also is susceptible to burning when it is dry.

Because of the wetness, this soil is poorly suited to corn and soybeans. Small grain planted in the fall and early spring may be damaged by ponding even if a satisfactory drainage system has been established for row crops. Windbreaks and cover crops help to control soil blowing. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content, improves tilth, and helps to control soil blowing.

Because of the wetness, this soil is generally not suited to grasses and legumes. Only water-tolerant species grow well.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only during very dry periods or when the ground is frozen. Special site preparation, such as furrowing or bedding before seedlings are planted, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding and low strength, this soil is generally unsuitable as a site for dwellings. It is generally unsuitable as a site for local roads because of the ponding, subsidence, and frost action and as a site for septic tank absorption fields because of the ponding and the slow permeability. Alternative sites for these uses should be selected.

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

My—Muskego muck, undrained. This nearly level, deep, very poorly drained soil is in depressions on moraines and till plains. It is subject to ponding by runoff from the adjacent soils. Areas are 2 to 20 acres in size. They generally are oval, but a few are irregularly shaped.

In a typical profile, the surface layer is black muck about 10 inches thick. The next 30 inches is black and dark reddish brown muck. Below this to a depth of about 60 inches is dark olive gray coprogenous earth. In places the organic material is more than 51 inches thick. In a few places it is underlain by mineral material ranging from sand to silty clay loam. In a few areas the soil has as much as 15 inches of mineral overwash. In some areas the depth to coprogenous earth is 15 to 25 inches.

Included with this soil in mapping are the very poorly drained Milford and Milford Variant soils around the edge of potholes. These soils formed in mineral material. They make up about 10 percent of the map unit.

Permeability is moderate or moderately rapid in the organic part of the Muskego soil and slow in the underlying coprogenous earth. The water table is near or above the surface during most of the year. Available water capacity is high. Organic matter content is very high in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas are not drained. Wetland plants are the dominant vegetation. Because of the ponding, this soil is generally unsuited to corn and soybeans and to grasses and legumes for hay or pasture. In a few areas attempts have been made to drain the soil. Corn and soybeans have been grown in these areas. A drainage system is difficult to establish and maintain because of a lack of adequate subsurface drainage outlets, subsidence, and the poor stability of the organic material and coprogenous earth. Diverting runoff from the higher surrounding areas away from this soil reduces the hazard of ponding.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment should be used only during extremely dry periods or when the ground is frozen. Special site preparation, such as bedding before seedlings are planted, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by proper site preparation or by cutting, spraying, or girdling.

Because of the ponding and low strength, this soil is generally unsuitable as a site for dwellings. It is generally unsuitable as a site for local roads because of the ponding, frost action, and subsidence and as a site for septic tank absorption fields because of the ponding. Alternative sites for these uses should be selected.

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

ObA—Ockley loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on terraces. Areas are generally elongated and are parallel to streams. They are 3 to 30 acres in size.

In a typical profile, the surface layer is dark brown loam about 10 inches thick. The subsoil is about 53 inches thick. It is firm. In sequence downward, it is dark yellowish brown clay loam, reddish brown gravelly clay loam and gravelly sandy clay loam, dark reddish brown gravelly sandy clay loam, and dark brown gravelly sandy loam. The underlying material to a depth of about 70 inches is brown gravelly coarse sand. In places the surface layer is gravelly loam, gravelly sandy loam, or sandy loam. In a few places it is darker. In a few areas gravelly coarse sand is within a depth of 40 inches. In a few places glacial till is as shallow as 55 inches.

Included with this soil in mapping are the somewhat poorly drained Waynetown soils on terraces adjacent to upland breaks. These soils make up 5 percent of the map unit.

Permeability is moderate in the subsoil of the Ockley soil and very rapid in the underlying material. Available water capacity is moderate. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a wide range in moisture content.

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

This soil is well suited to corn, soybeans, and small grain. Fall-seeded crops grow well. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth. Droughtiness is a problem during extended dry periods.

This soil is well suited to pasture grasses and legumes. The main management concern is overgrazing. 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 concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps to prevent the damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is suitable as a site for septic tank absorption fields.

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

OcA—Ockley silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on terraces and outwash plains. Areas are 3 to 150 acres in size. They generally are irregularly shaped, but some areas along streams are elongated.

In a typical profile, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 48 inches thick. It is firm. In sequence downward, it is dark yellowish brown silty clay loam, brown loam, brown gravelly sandy clay loam, reddish brown gravelly sandy loam, and dark reddish brown gravelly coarse sandy loam. The underlying material to a depth of about 65 inches is yellowish brown gravelly coarse sand. In places the lower part of the subsoil is loamy sand. In a few places the underlying glacial till or bedrock is as shallow as 55 inches. In a few areas as much as 10 percent of the surface is covered by gravel. In a few places the depth to loose sand and gravel is less than 40 inches. In a few areas the silty material is as much as 30 inches thick.

Included with this soil in mapping are the moderately well drained Rush Variant soils. These soils are in positions on the landscape similar to those of the Ockley soil. Also included are the somewhat poorly drained Waynetown soils in drainageways and slight depressions and a few areas of shallow soils on steep breaks. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Ockley soil and very rapid in the underlying material. Available water capacity is moderate or high. Surface runoff is slow. Organic matter content is moderately low 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 corn, soybeans, or small grain. Some are used for hay and pasture. A few are used as woodlots. A few have gravel and sand pits.

This soil is well suited to corn, soybeans, and small grain. Fall-seeded crops grow well. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. The main management concern is overgrazing. 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 concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps to prevent the damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength and frost action. The base should be strengthened with suitable material. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The soil is suitable as a site for septic tank absorption fields.

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

OcB—Ockley silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on terraces and outwash plains. Areas are 3 to 80 acres in size. They generally are irregularly shaped, but some areas along streams are elongated.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 60 inches thick. It is firm. The upper part is dark yellowish brown silty clay loam, the next part is dark brown clay loam, and the lower part is dark reddish brown gravelly sandy clay loam. The underlying material to a depth of about 80 inches is brown, loose gravelly coarse sand. In some areas the surface layer is sandy loam, loam, or the gravelly analogs of these textures. In a few places gravelly coarse sand is within a depth of 40 inches. In a few areas the surface layer is darker. In a few places the content of gravel is less than 15 percent in the subsoil. In places the underlying glacial till or bedrock is as shallow as 55 inches. In a few areas the silty material is as much as 30 inches thick.

Included with this soil in mapping are the somewhat poorly drained Waynetown soils in drainageways. Also included are a few small areas of severely eroded soils that have more clay in the surface layer than the Ockley soil. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Ockley soil and very rapid in the underlying material. Available water capacity is moderate. Surface runoff is medium. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are used for corn, soybeans, or small grain. A few are used for hay, pasture, or woodland. A few have sand and gravel pits.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by terraces, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to pasture grasses and legumes, including deep-rooted legumes, such as alfalfa. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is suitable as a site for septic tank absorption fields.

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

OcC2—Ockley silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on terraces. Areas are irregularly shaped and are 3 to 20 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 46 inches thick. It is firm. In sequence downward, it is dark yellowish brown clay loam, brown gravelly clay loam, brown gravelly sandy clay loam, and reddish brown gravelly sandy loam. The underlying material to a depth of about 60 inches is brown gravelly coarse sand. In several places the surface layer is loam or clay loam. In a few places gravelly coarse sand is within a depth of 40 inches. In some areas glacial till is within a depth of 60 inches. In a few places the silty material is as much as 26 inches thick. In a few areas bedrock is within a depth of 60 inches.

Permeability is moderate in the subsoil of the Ockley soil and very rapid in the underlying material. Available water capacity is moderate. Surface runoff is rapid. Organic matter content is moderately low 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 corn, small grain, hay, or pasture. A few small areas are wooded. A few have gravel and sand pits.

If erosion is controlled, this soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the slope and the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps 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. Building on random lots, leaving as much of the existing vegetation on the site as possible, and reseeding exposed areas as soon as possible after construction help to control erosion. The soil is moderately limited as a site for local roads and streets because of the slope, low strength, and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is moderately limited as a site for septic tank absorption fields because of the slope. The distribution lines should be installed on the contour.

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

OfB2—Ockley silt loam, kame, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on kames characterized by knobs and potholes. Areas are 3 to 70 acres in size. They generally are oval, but some are irregularly shaped.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. It has dark yellowish brown subsoil material. The subsoil is about 51 inches thick. It is firm. In sequence downward, it is dark yellowish brown silty clay loam, dark yellowish brown loam, dark brown sandy loam, dark yellowish brown loam, and dark brown gravelly coarse sandy loam. The underlying material to a depth of about 70 inches is pale brown gravelly coarse sand. In a few places the content of gravel in the subsoil is as much as 25 percent. In some areas the gravel in the underlying material is dominantly fine. In other areas the texture of underlying material varies within short distances, ranging from gravelly coarse sand to fine sand and silt. In a few areas the surface layer is sandy loam. In some places gravelly coarse sand is within a depth of 40 inches. In other places the surface layer is darker. In a few areas the silty material is as much as 28 inches thick. In places glacial till is within a depth of 50 inches.

Included with this soil in mapping are areas of severely eroded soils. These soils have more clay in the surface layer than the Ockley soil. Also included are the somewhat poorly drained Fincastle and Starks soils in swales between the kames. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Ockley soil and very rapid in the underlying material. Available water capacity is moderate. Surface runoff is medium. Organic matter content is moderately low 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 corn, soybeans, or small grain. Some are used for hay and pasture. A few small areas are used as woodlots. Some have gravel and sand pits.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is suitable as a site for septic tank absorption fields.

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

OfC2—Ockley silt loam, kame, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on kames characterized by knobs and potholes. Areas are 3 to 35 acres in size. They generally are oval, but some are irregularly shaped.

In a typical profile, the surface layer is dark yellowish brown silt loam about 7 inches thick. It has brown subsoil material. The subsoil is about 52 inches thick. In sequence downward, it is brown, firm clay loam; brown, firm gravelly sandy clay loam; brown, firm gravelly sandy loam; and brown, friable loamy sand. The underlying material to a depth of about 70 inches is brown gravelly coarse sand. In a few places the content of gravel in the subsoil is as much as 30 percent. In some areas the gravel in the underlying material is dominantly fine. In other areas the texture of the underlying material varies within short distances, ranging from gravelly coarse sand to very fine sand and silt. In places the surface layer is loam. In a few areas it is sandy loam. In a few places gravelly coarse sand is within a depth of 40 inches. In a few areas the silty material is as much as 28 inches thick. In places glacial till is within a depth of 50 inches.

Included with this soil in mapping are areas of severely eroded soils. These soils have more clay in the surface layer than the Ockley soil. Also included are the somewhat poorly drained Fincastle and Starks soils in swales between the kames. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Ockley soil and very rapid in the underlying material. Available water capacity is moderate. Surface runoff is rapid. Organic matter content is moderately low 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 corn, small grain, hay, or pasture. A few small areas are wooded. Some have gravel and sand pits.

If erosion is controlled, this soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the slope and the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps 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. Building on random lots, leaving as much of the existing vegetation on the site as possible, and reseeding exposed areas as soon as possible after construction help to control erosion. The soil is moderately limited as a site for local roads and streets because of low strength, the slope, and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is moderately limited as a site for septic tank absorption fields because of the slope. Installing the distribution lines on the contour helps to overcome this limitation.

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

OhB—Ockley loam, bedrock substratum, 1 to 4 percent slopes. This gently sloping, deep, well drained soil is on bedrock terraces along Sugar Creek and its larger tributaries. Areas are 3 to 10 acres in size. Most are elongated and parallel streams, but some are irregularly shaped.

In a typical profile, the surface layer is very dark grayish brown loam about 10 inches thick. The subsoil is about 43 inches thick. The upper part is dark yellowish brown, friable loam; the next part is strong brown and dark yellowish brown gravelly sandy clay loam; and the lower part is yellowish brown gravelly silt loam. Yellowish brown siltstone is at a depth of about 53 inches. In some places the depth to bedrock ranges from 40 to 60 inches. In other places the surface layer is sandy loam. In some areas as much as 2 feet of loose gravelly coarse sand overlies the bedrock. In some areas along the smaller streams, the soil contains little, if any, gravel. In a few places the lower lying terraces are subject to rare flooding. In some places the soil formed in silty material and in the underlying material weathered from shale. In other places the surface layer is darker. In a few places the bedrock is as shallow as 35 inches. In a few areas along Walnut Fork and Sugar Creek, the soil is underlain by limestone.

Included with this soil in mapping are areas of the somewhat poorly drained Shadeland soils on the lower rises. Also included are areas of shallow soils on steep breaks. Included soils make up about 10 percent of the map unit.

Permeability and available water capacity are moderate in the Ockley soil. Surface runoff is medium. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are used for corn or soybeans. Some are used for hay and pasture. A few are wooded.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. Droughtiness may be a limitation in extended dry periods. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming. Diversions and grassed waterways help to control erosion.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing minimize compaction and help to keep the pasture in good condition.

This soil is well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and installing foundation drain tile help to prevent the damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of the shrink-swell potential and frost action. The base should be strengthened with suitable material. The soil is moderately limited as a site for septic tank absorption fields because of the depth to bedrock. The distribution lines should be installed as shallow as regulations permit.

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

OnB—Octagon loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 35 acres in size.

In a typical profile, the surface layer is very dark grayish brown loam about 8 inches thick. The subsoil is about 22 inches thick. It is firm. The upper part is dark yellowish brown clay loam, the next part is dark brown loam, and the lower part is yellowish brown loam. The underlying material to a depth of about 60 inches is yellowish brown fine sandy loam. In places the lower part of the subsoil is sandy loam or loamy sand. In a few areas the solum is more than 40 inches thick. In some areas the surface layer is thicker. In a few places it is lighter colored. In a few areas the lower part of the subsoil is mottled.

Included with this soil in mapping are small areas of the somewhat poorly drained Raub and Toronto soils in drainageways and swales. Also included are a few areas of severely eroded soils that have more clay in the surface layer than the Octagon soil. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the upper part of the Octagon soil and moderately slow in the underlying material. Available water capacity is moderate. Surface runoff is medium. 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 corn, soybeans, or small grain. A few are used for hay and pasture.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming. A subsurface drainage system is needed in seepy areas in some drainageways.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing is the main management concern. It results in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is suitable as a site for dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Seepage along the top of the compact till can result in wetness in basements. Installing perimeter surface drains and backfilling with permeable material help to overcome the wetness and help to prevent the structural damage caused by shrinking and swelling.

This soil is moderately limited as a site for local roads and streets because of low strength and frost action. The base should be strengthened with suitable material.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Lateral seepage and the resultant surfacing of effluent are problems. Installing curtain drains in upslope areas helps to control this seepage. Filling or mounding improves the ability of the field to absorb the effluent.

The land capability classification is IIe. No woodland ordination symbol is assigned.

OnC—Octagon loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 40 acres in size.

In a typical profile, the surface layer is dark brown loam about 7 inches thick. The subsoil is about 29 inches thick. The upper part is dark yellowish 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 yellowish brown loam. In a few places the lower part of the subsoil is mottled. In some places the surface layer is gravelly. In other places it is thicker. In some areas it is lighter colored. In a few places the lower part of the subsoil is loamy sand or sandy loam. In a few areas the solum is more than 40 inches thick.

Included with this soil in mapping are small areas of Raub and Toronto soils in drainageways. Also included are areas of severely eroded soils that have more clay in the surface layer than the Octagon soil. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the upper part of the Octagon soil and moderately slow in the underlying material. Available water capacity is moderate. Surface runoff is medium. Organic matter content is moderately low or 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 corn, soybeans, or small grain. A few are used for hay or pasture.

If erosion is controlled, this soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by grassed waterways, diversions, and cropping systems that include grasses and legumes. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings. Properly designing foundations and basement walls helps to prevent the structural damage caused by shrinking and swelling. Lateral seepage along the top of the till can result in wetness in basements. Installing perimeter subsurface drains and backfilling with permeable material help to overcome the wetness and help to prevent the structural damage caused by shrinking and swelling. The buildings should be constructed in the less sloping areas. Maintaining as much of the existing vegetative cover as possible and reseeding disturbed areas as soon as possible help to control erosion.

This soil is severely limited as a site for local roads and streets because of low strength. The base should be strengthened with suitable material.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the slope. Lateral seepage and the resultant surfacing of effluent are problems. Installing curtain drains in upslope areas helps to control this seepage. Filling or mounding improves the ability of the field to absorb the effluent.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

OsB—Ormas loamy sand, 1 to 4 percent slopes. This gently sloping, deep, well drained soil is on low terraces along Sugar Creek. Areas generally are elongated and parallel to the creek or old oxbows of the creek. They are 3 to 20 acres in size.

In a typical profile, the surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsoil is about 42 inches thick. The upper part is dark yellowish brown and yellowish brown, very friable loamy fine sand and loamy sand; the next part is dark yellowish brown, firm fine sandy loam; and the lower part is dark brown, firm gravelly coarse sandy loam. The underlying material to a depth of about 60 inches is very pale brown gravelly coarse sand. In some places the surface layer is thicker. In other places it is lighter colored. In a few areas it is sandy loam.

Included with this soil in mapping are small areas of the well drained Ockley soils. These soils have less sand in the upper part than the Ormas soil. They are in positions on the landscape similar to those of the Ormas soil. Also included are some areas where the sandy material extends to a depth of 60 inches, areas of the well drained Boyer soils on the steeper breaks, and a few low areas that are subject to rare flooding. Boyer soils are deeper to the underlying material than the Ormas soil. Included soils make up about 10 percent of the map unit.

Permeability is moderately rapid in the subsoil of the Ormas soil and very rapid in the underlying material. Available water capacity is low or moderate. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are used for corn, soybeans, or wheat. Several are pastured.

Because of the limited available water capacity, this soil is only fairly well suited to corn and soybeans. It is better suited to small grain, which is not so susceptible to summer drought. Soil blowing is a problem if the soil does not have an adequate vegetative cover when it is dry. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control soil blowing and water erosion, conserves moisture, improves tilth, and increases the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. The main management concerns are overgrazing and the limited available water capacity. Proper stocking rates, pasture rotation, and timely deferment of grazing during dry periods help to keep the pasture in good condition and minimize the damage caused by drought.

This soil is fairly well suited to trees. The main management concerns are seedling mortality and plant competition. Overstocking helps to establish a good stand. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil is well suited to dwellings. It is moderately limited as a site for local roads and streets because of frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by frost action. Because of a poor filtering capacity, the soil is severely limited as a site for septic tank absorption fields. Excavating the sandy material and filling with loamy material improve the filtering capacity of the field.

The land capability classification is IIIs. The woodland ordination symbol is 4S.

Pd—Palms muck, drained. This nearly level, deep, very poorly drained soil is in depressions on flood plains, till plains, and moraines. It is periodically ponded by runoff from the adjacent soils. Areas are irregularly shaped and are 3 to 200 acres in size.

In a typical profile, the surface layer is black muck about 10 inches thick. The subsurface layer also is black muck. It is about 7 inches thick. The underlying material to a depth of about 60 inches is dark grayish brown, grayish brown, and gray, mottled silt loam stratified with fine sand and loamy sand. In a few places fire has destroyed much of the organic material. In a few areas the organic layer is as thin as 10 inches. In some places thin layers of coprogenous earth are at a depth of about 20 inches. In other places the organic material is more than 51 inches thick. In a few areas the underlying material is sand, marl, or interbedded marl and loamy material.

Included with this soil in mapping are small areas of the very poorly drained Milford Variant and Wallkill soils in the slightly higher landscape positions. Also included are some areas on flood plains that are occasionally flooded and areas where the soil is saturated most of the year and the dominant vegetation is wetland weeds. Included soils make up about 10 percent of the map unit.

Permeability is moderately slow to moderately rapid in the organic part of the Palms soil and moderate or moderately slow in the mineral material. The water table is near or above the surface from late fall to late spring. Surface runoff is ponded. Available water capacity is high. Organic matter content is very high in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are drained and are used for corn. Some are used for soybeans. A few are wooded or are left idle.

If drained, this soil is fairly well suited to corn and soybeans. Small grain planted in the fall and early spring may be damaged by ponding even if a satisfactory drainage system has been established for row crops. A drainage system of subsurface drains and open ditches has been established in most areas. Subsurface drains work well in most areas, but they should not be installed too deep in underlying mineral material of compact glacial till. A drainage system is difficult to establish and maintain because of inadequate outlets and subsidence in the organic material. Pumping stations have been installed in a few areas. Pumping the excess water during the growing and harvesting seasons and allowing the area to pond in the winter minimize the subsidence caused by oxidation of the organic material. This material is susceptible to burning when it is dry. If the soil is dry and unprotected, soil blowing is a hazard (fig. 10). It can be controlled by windbreaks, cover crops, and a system of conservation tillage that leaves protective amounts of crop residue on the surface.

Because of the wetness, this soil is generally unsuited to pasture. Only water-tolerant grasses, such as reed canarygrass, grow well unless an extensive drainage system is installed.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only when the ground is frozen or during very dry periods. Special site preparation, such as furrowing or bedding, and selection of large seedlings for planting reduce the seedling mortality rate. Because of

Figure 10.—An area of Palms muck, drained, where windblown organic material from the surface layer has accumulated in a fence row.

the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil is generally unsuitable as a site for dwellings because of ponding and low strength, as a site for local roads because of ponding and frost action, and as a site for septic tank absorption fields because of ponding and subsidence. Alternative sites for these uses should be selected.

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

PfB—Parr silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 40 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is about 23 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the next part is dark 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 fine sandy loam. In some places the solum is more than 40 inches thick. In other places the lower part of the subsoil is sandy loam, loamy sand, or sand. In some areas the surface layer is 6 to 10 inches thick. In a few places the lower part of the subsoil is mottled. In places the silty material is as much as 30 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Raub soils in drainageways. Also included are areas of severely eroded soils that have more clay in the surface layer than the Parr soil. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the upper part of the Parr soil and moderately slow in the underlying material. Available water capacity is high. Surface runoff is medium. 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 corn or soybeans. A few are used for small grain or hay.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by grassed waterways, diversions, and cropping systems that include grasses and legumes. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing is the main management concern. It results in surface compaction. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Lateral seepage along the top of the firm till can result in wetness in basements. Properly designing foundations, footings, and basement walls helps to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of frost action and the shrink-swell potential. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Lateral seepage and the resultant surfacing of effluent are problems. Installing curtain drains in upslope areas helps to control this seepage. Filling or mounding improves the ability of the field to absorb the effluent.

The land capability classification is IIe. No woodland ordination symbol is assigned.

Ph—Pella silty clay loam. This nearly level, deep, very poorly drained soil is in depressions on outwash plains and till plains. It is periodically ponded by runoff from the adjacent soils. Areas are irregularly shaped and are 3 to 100 acres in size.

In a typical profile, the surface layer is black silty clay loam about 11 inches thick. The subsoil is mottled, firm silty clay loam about 23 inches thick. The upper part is dark gray, and the lower part is grayish brown. The underlying material to a depth of about 60 inches is gray, friable silt loam that has thin strata of very fine sand. In a few places the underlying material has thin layers of marl and snail shells. In a few areas the surface layer is lighter colored and contains carbonates.

Included with this soil in mapping are the very poorly drained Mahalasville soils. These soils are in the slightly higher landscape positions. They make up about 5 to 10 percent of the map unit.

Permeability is moderate in the Pella soil. Available water capacity is high. The water table is near or above the surface in the winter and early spring. Surface runoff is slow. Organic matter content is high in the surface layer. This layer can be tilled only throughout a narrow range in moisture content.

Most areas are drained and are used for corn or soybeans. A few are left idle because of the wetness.

If drained, this soil is well suited to corn and soybeans. Because of the ponding in winter and early spring, it is poorly suited to small grain. The wetness is the main limitation. A drainage system of surface drains, subsurface drains, open ditches, or a combination of these has been established in most areas. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth. The soil is suited to fall plowing.

Because of the ponding, this soil is only fairly well suited to pasture grasses and legumes. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and for septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding, frost action, and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The base should be strengthened with suitable material.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Po—Pits, gravel. This map unit is in areas on terraces, outwash plains, and kames where sand and gravel have been excavated. Slopes range from 0 to 80 percent.

A typical profile has layers of very gravelly coarse sand and gravelly coarse sand that vary in thickness.

Included in this unit in mapping are small areas of water and, around the edge of the pits, areas of soil material that was removed as overburden and now supports sparse vegetation. Also included are a few areas where soil and manmade material have been dumped into the pit.

Most areas of this unit support little or no vegetation. The soil features that affect engineering uses vary greatly. Some areas have a seasonal high water table. If the unit is used as a building site, onsite investigation is needed.

No land capability classification or woodland ordination symbol is assigned.

Pq—Pits, quarries. This map unit is in areas on uplands and terraces where limestone and shale have been quarried. The limestone was crushed and used as roadbuilding material and agricultural lime. The shale was used in making tile and brick. It is still being removed from one of the pits. Slopes range from 0 to 80 percent.

In a typical profile of a limestone quarry, the face is hard, bedded, gray limestone. The beds are thin to thick. In places sandstone overlies the limestone. In a typical profile of a shale pit, the face is soft to hard, bedded, gray and brown siltstone and shale. The beds are thin.

Included in this unit in mapping are small areas of water and, around the edge of the pits, areas of soil material that was removed as overburden and now supports sparse vegetation. Also included are a few areas where soil material and rubbish have been dumped into the pit.

Most areas of this unit support little or no vegetation. The soil features that affect engineering uses vary greatly. Some areas have a seasonal high water table. If the unit is used as a building site, onsite investigation is needed.

No land capability classification or woodland ordination symbol is assigned.

PrA—Proctor silt loam, moderately wet, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is black silt loam about 12 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown, firm silt loam and silty clay loam; the next part is brown, mottled, firm silty clay loam; and the lower part is yellowish brown, mottled, firm sandy clay loam and silt loam. The underlying material to a depth of about 65 inches is yellowish brown, mottled loam that has strata of loamy sand. In places the dark surface layer is 6 to 10 inches thick. In several places glacial till is at a depth of about 50 inches. In some areas the underlying material is loam or sandy loam and does not have sandy strata. In other areas the subsoil is not mottled within a depth of 40 inches. In a few places it contains more sand and less silt.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton soils on the slightly lower rises and the poorly drained Drummer soils in depressions. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Proctor soil and moderate or moderately rapid in the underlying material. Available water capacity is high. Surface runoff is slow. The water table is at a depth of 2.5 to 6.0 feet during the winter and early spring. Organic matter content is moderate in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are used for corn, soybeans, or small grain. Some are used for pasture and hay.

This soil is well suited to corn, soybeans, and small grain. A subsurface drainage system is needed in some areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is moderately limited as a site for dwellings with basements because of the wetness and the shrink-swell potential. Strengthening footings and foundations and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling. Installing perimeter subsurface drains helps to overcome the wetness. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness. Perimeter interceptor subsurface drains help to lower the water table.

The land capability classification is I. No woodland ordination symbol is assigned.

PrB—Proctor silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on till plains and moraines. Areas are irregularly shaped and are 3 to 100 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 45 inches thick. The upper part is dark yellowish brown, firm silt loam and silty clay loam; the next part is dark yellowish brown, firm loam; and the lower part is brown, firm fine sandy loam and loose fine sand. The underlying material to a depth of about 65 inches is yellowish brown loamy fine sand that has strata of brown fine sand and sandy loam. In some places the dark surface layer is 8 to 10 inches thick. In other places loam till is at a depth of about 50 inches. In a few areas the content of gravel ranges from 10 to 20 percent in the lower part of the subsoil and in the underlying material. In some areas the upper part of the subsoil contains more silt and less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton soils in drainageways and swales. These soils make up about 5 percent of the map unit.

Permeability is moderate in the subsoil of the Proctor soil and moderate or moderately rapid in the underlying material. Available water capacity is high. Surface runoff is medium. 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 corn, soybeans, or small grain. Some are used for hay and pasture.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by diversions, or by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, maintains tilth, and increases the organic matter content. This soil is well suited to no-till farming.

This soil is well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. The main management concern is overgrazing. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing footings, foundations, and basement walls and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is suitable as a site for septic tank absorption fields.

The land capability classification is IIe. No woodland ordination symbol is assigned.

Ra—Ragsdale silty clay loam. This nearly level, deep, very poorly drained soil is in depressions on till plains. It is periodically ponded by runoff from the adjacent soils. Areas are 3 to 500 acres in size. Most are fingerlike in shape. Some are a few miles long.

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, mottled silty clay loam about 3 inches thick. The subsoil is about 37 inches thick. The upper part is gray, mottled, firm silty clay loam, and the lower part is light brownish gray, mottled, friable silt loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled silt loam. In a few places the lower part of the solum formed in glacial drift and contains more sand. In some areas the surface layer is lighter colored.

Included with this soil in mapping are small, slightly convex areas of the somewhat poorly drained Fincastle and Reesville soils. These soils make up about 10 percent of the map unit.

Permeability is moderate in the Ragsdale soil. Available water capacity is high. The water table is near or above the surface during winter and early spring. Surface runoff is ponded or very slow. Organic matter content is moderate or high in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas are drained and are used for corn, soybeans, or small grain. A few are used as hayland, pasture, or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. A drainage system of open ditches, surface drains, subsurface drains, or a combination of these has been established in most areas. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. The soil is well suited to fall plowing.

If drained, this soil is well suited to grasses and legumes. The ponding, however, can damage the stands. Overgrazing or grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, timely deferment of grazing, and pasture rotation minimize compaction and help to maintain tilth and plant density.

This soil is 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. Species that can withstand the wetness should be favored in the stands. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and for septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding, low strength, and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The base should be strengthened with suitable material.

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

ReA—Raub silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is very dark gray silt loam about 10 inches thick. The subsurface layer also is very dark gray silt loam. It is about 3 inches thick. The subsoil is about 47 inches thick. The upper part is dark grayish brown, dark yellowish brown, and yellowish brown, mottled, firm silty clay loam, and the lower part is yellowish brown and dark yellowish brown, mottled, firm loam. The underlying material to a depth of about 70 inches is yellowish brown, mottled loam. In a few places the solum is less than 40 inches thick. In some areas thin layers of fine sandy loam, sandy loam, or loamy sand are directly above the loam till. In a few areas the upper part of the subsoil is not mottled.

Included with this soil in mapping are the poorly drained Drummer soils in depressions and the moderately well drained or well drained Proctor soils on the higher rises. Included soils make up about 10 to 15 percent of the map unit.

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

Nearly all areas are drained by subsurface drains and open ditches and are used for corn, soybeans, or small grain. Some are used for hay or pasture.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

If drained, this soil is well suited to pasture grasses and legumes, such as orchardgrass and clover. Overgrazing and grazing when the soil is wet are the main management concerns. They result in 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 severely limited as a site for dwellings because of the wetness. Surface and subsurface drains help to overcome this limitation. The buildings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable fill material. The soil is severely limited for septic tank absorption fields because of the wetness and the moderately slow permeability. Perimeter interceptor subsurface drains lower the water table. Filling or mounding improves the ability of the field to absorb the effluent.

The land capability classification is IIw. No woodland ordination symbol is assigned.

RIA—Reesville silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on till plains and outwash plains. Areas are irregularly shaped and are 3 to 400 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 1 inch thick. The subsoil is about 36 inches thick. The upper part is grayish brown and yellowish brown, mottled, firm silty clay loam, and the lower part is light olive brown, mottled, firm silt loam. The underlying material to a depth of about 60 inches is light olive brown, mottled silt loam. In a few areas glacial till is at a depth of about 50 inches. In some places the depth to carbonates is more than 60 inches. In other places the underlying material has thin strata of sand.

Included with this soil in mapping are small areas of the moderately well drained Birkbeck and Xenia soils on the higher rises and the very poorly drained Ragsdale soils in depressions. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the upper part of the Reesville soil and moderately slow in the underlying material. Available water capacity is high. The water table is at a depth of 1.0 to 2.5 feet in the winter and early spring. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content. If the soil supports little or no vegetation, surface crusting may be a problem following heavy rainfall.

Most areas of this soil are drained by subsurface drains and open ditches and are used for corn or soybeans. Some are used for wheat, hay, or pasture. A few are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main management concern. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and tilling at the proper moisture content improve tilth, increase the organic matter content, and minimize crusting.

If drained, this soil is well suited to pasture grasses and legumes, such as orchardgrass and clover. Overgrazing and grazing when the soil is wet are the main management concerns. They result in 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. The main management concerns are the equipment limitation and plant competition. Equipment should be used only when the ground is dry or frozen. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. The buildings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow permeability. Perimeter interceptor subsurface drains help to lower the water table. Filling or mounding improves the ability of the field to absorb the effluent.

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

RnA—Reesville-Fincastle silt loams, 0 to 2 percent slopes. These nearly level, deep, somewhat poorly drained soils are on slight rises on till plains. The Reesville soil is on the lower, less sloping parts of the landscape. The Fincastle soil is on the higher, more sloping parts. Areas are irregularly shaped and are 3 to 400 acres in size. They are about 50 percent Reesville soil and 35 percent Fincastle soil. The two soils occur as areas so intricately mixed that mapping them separately was not practical.

In a typical profile of the Reesville soil, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 40 inches thick. The upper part is yellowish brown, mottled, firm silt loam and silty clay loam, and the lower part is light olive brown, mottled, firm and friable silt loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the silty material is leached of carbonates to a depth of more than 60 inches.

In a typical profile of the Fincastle soil, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 32 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam and silt loam, and the lower part is loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In places calcareous loam till is within a depth of 30 inches. In some eroded areas the surface layer is yellowish brown.

Included with these soils in mapping are areas of the moderately well drained Xenia and Birkbeck soils on the more sloping rises and breaks and small areas of the very poorly drained Ragsdale soils in swales and along drainageways. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the subsoil of the Reesville and Fincastle soils and moderately slow in the underlying material. Available water capacity is high. In the winter and early spring, the water table is at a depth of 1.0 to 3.0 feet in the Fincastle soil and 1.0 to 2.5 feet in the Reesville soil. Surface runoff is slow on both soils. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content. Surface crusting may be a problem following heavy rains if the soils have little or no plant cover.

Most areas of these soils are drained by subsurface drains and open ditches and are used for corn or soybeans. Some are used for pasture, hay, or small grain. A few are wooded.

If drained, these soils are well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface tile drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. Tilling at the proper moisture content and applying a system of conservation tillage that leaves protective amounts of crop residue on the surface improve tilth, increase the organic matter content, and minimize crusting.

If drained, these soils are well suited to pasture grasses and legumes, such as orchardgrass and alfalfa. Overgrazing and grazing when the soil is wet are the main management concerns. They result in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concerns are the equipment limitation and plant competition. Equipment should be used only when the ground is dry or frozen. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, these soils are severely limited as sites for dwellings. Subsurface and surface drains help to overcome this limitation. The buildings should be constructed without basements. The soils are severely limited as sites for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action. The base should be strengthened with suitable material. Because of the wetness and the moderately slow permeability, the soils are severely limited as sites for septic tank absorption fields. Perimeter interceptor subsurface drains help to lower the water table. Filling or mounding improves the ability of the field to absorb the effluent.

The land capability classification is IIw. The woodland ordination symbol assigned to the Reesville soil is 4W, and that assigned to the Fincastle soil is 4A.

RoG—Rodman-Rock outcrop complex, 35 to 70 percent slopes. This very steep map unit is on terrace breaks. The excessively drained Rodman soil is shallow over gravelly coarse sand. It is on the upper part of the slopes. The Rock outcrop is on the lower part. Slopes are 50 to 150 feet long. Areas generally are elongated and are parallel to streams. They are 3 to 50 acres in size. They are about 50 percent Rodman soil and 40 percent Rock outcrop. The Rodman soil and Rock outcrop could not be mapped separately at the scale used.

In a typical profile of the Rodman soil, the surface layer is very dark gray gravelly loam about 5 inches thick. The subsoil is dark yellowish brown, very friable gravelly sandy loam about 5 inches thick. The underlying material to a depth of about 60 inches is yellowish brown very gravelly coarse sand. In some areas the surface layer is loam. In a few areas the depth to sand and gravel is more than 15 inches. In a few places the soil formed in glacial till.

The Rock outcrop typically has a 5- to 10-foot layer of sandstone, which overlies shale. In some places limestone rather than sandstone caps the shale. In other places no sandstone or limestone overlies the shale. In several areas, sandy and gravelly material has sloughed over the bedrock and a soil has formed in this material.

Included with this unit in mapping are areas of the well drained Ockley and Rush soils on ridgetops. These soils make up 10 percent of the map unit.

Permeability is very rapid in the Rodman soil. The Rock outcrop is impervious, except where water moves through the fractures. Available water capacity is very low or low in the Rodman soil. Surface runoff is very rapid on the Rodman soil and the Rock outcrop. Organic matter content is moderate in the surface layer of the Rodman soil.

Practically all areas are wooded. Because of the slope and the low or very low available water capacity, this unit is generally unsuited to crops and pasture. It is poorly suited to trees. The erosion hazard, the equipment limitation, and seedling mortality are severe. Because of the erosion hazard, logging roads, skid trails, and landings should be constructed 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, may be needed to minimize the use of rubber-tired and crawler tractors. If ruts are cut in the sand and gravel when the trees are logged, gullies can form.

Because of the slope, this unit is generally unsuitable as a site for dwellings, septic tank absorption fields, and local roads and streets. An alternative site should be selected.

The land capability classification is VIIs. The woodland ordination symbol assigned to the Rodman soil is 4R.

RtA—Rush silt loam, 0 to 1 percent slopes. This nearly level, deep, well drained soil is on terraces and outwash plains. Areas are 5 to 100 acres in size. Most are elongated and are parallel to streams.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 52 inches thick. The upper part is dark yellowish brown and brown, firm silt loam and silty clay loam; the next part is brown, firm clay loam; and the lower part is dark brown, firm and friable gravelly loam and gravelly sandy loam. The underlying material to a depth of about 70 inches is brown gravelly sand. In a few places the silty material is as much as 60 inches thick. In places the content of gravel is less than 15 percent in the lower part of the subsoil. In a few places mottles are below a depth of 30 inches. In some areas loam till or bedrock is within a depth of 70 inches. In other areas the silty material is 19 to 24 inches thick.

Included with this soil in mapping are small areas of the moderately well drained Rush Variant soils on the slightly lower rises and the somewhat poorly drained Waynetown soils on the lower rises. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the Rush soil. Available water capacity is high. Surface runoff is slow. Organic matter content is moderately low 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 corn, soybeans, or small grain. Some are used for hay and pasture. A few are wooded. A few have gravel and sand pits.

This soil is well suited to corn, soybeans, and small grain. Fall-seeded crops grow well. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Deep-rooted legumes grow well. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is suitable as a site for septic tank absorption fields.

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

RtB—Rush silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on terraces and outwash plains. Areas are 30 to 50 acres in size. They generally are irregularly shaped, but some are elongated and parallel streams.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 56 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the next part is brown, firm clay loam; and the lower part is brown, firm gravelly loam. The underlying material to a depth of about 80 inches is brown gravelly sand. In places glacial till is within a depth of 60 inches. In a few areas bedrock is at a depth of about 6 feet. In some of the most sloping areas, the silty material is 20 to 24 inches thick.

Included with this soil in mapping are the somewhat poorly drained Waynetown and moderately well drained Rush Variant soils on the slightly lower rises. These soils make up about 5 percent of the map unit.

Permeability is moderate in the Rush soil. Available water capacity is high. Surface runoff is medium. Organic matter content is moderately low 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 corn, soybeans, or small grain. A few are used for hay, pasture, or woodland. A few have sand and gravel pits.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by grassed waterways and by a cropping sequence dominated by grasses and legumes. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls helps to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. The base should be strengthened with suitable material. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The soil is suitable as a site for septic tank absorption fields.

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

RwA—Rush Variant silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on outwash plains and terraces. Areas are irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 50 inches thick. It is firm. In sequence downward, it is yellowish brown and dark yellowish brown silty clay loam; brown and yellowish brown, mottled silty clay loam; yellowish brown, mottled clay loam; and grayish brown and dark grayish brown, mottled gravelly sandy clay loam. The underlying material to a depth of about 65 inches is brown gravelly loamy sand. In a few places the silty material is less than 20 inches thick. In a few areas glacial till is within a depth of 55 inches. In several places the subsoil is mottled within a depth of 40 inches. In a few areas the surface layer is darker.

Included with this soil in mapping are the somewhat poorly drained Waynetown and well drained Rush soils. Waynetown soils are in the slightly lower areas. Rush soils are in positions on the landscape similar to those of the Rush Variant soil. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the subsoil of the Rush Variant soil and rapid in the underlying material. Available water capacity is high. The water table is at a depth of 2 to 6 feet in the winter and early spring. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are used for corn, soybeans, or small grain. A few are used for hay or woodland.

This soil is well suited to corn, soybeans, and small grain. A tile drainage system is needed in some areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. The main management concern is overgrazing. 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 concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness and the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Installing a subsurface drainage system around foundations and footings helps to lower the water table. Properly designing foundations and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic absorption fields because of the wetness. Perimeter interceptor subsurface drains help to lower the water table and remove excess water.

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

RxC—Russell silt loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on moraines and on ridgetops and side slopes on till plains. Areas are irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 8 inches thick. The subsoil is about 52 inches thick. The upper part is yellowish brown, friable silt loam; the next part is yellowish brown and dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown and dark yellowish brown, firm loam and clay loam. The underlying material to a depth of about 70 inches is brown loam. In a few places the solum is more than 70 inches thick and is sandy loam or sandy clay loam in the lower part. In some places the loess is more than 40 inches thick. In other places mottles are as shallow as 24 inches. In a few places, the loess is less than 24 inches thick and the depth to glacial till is less than 40 inches. In a few areas limestone bedrock is at a depth of about 55 inches.

Included with this soil in mapping are the moderately well drained Birkbeck and Xenia soils in drainageways and on toe slopes and foot slopes and a few small areas of Miami soils on the steeper slopes. Miami soils have a solum that is thinner than that of the Russell soil. Also included are areas of eroded and severely eroded soils that have more clay in the surface layer than the Russell soil. Included soils make up about 15 percent of the map unit.

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

Nearly all areas of this soil are wooded. Many are in Shades State Park and are used for hiking trails. A few are used for corn, soybeans, wheat, or hay.

If erosion is controlled, this soil is fairly well suited to corn and soybeans. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content and the rate of water infiltration. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarse textured material 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. Foundation drains help to remove excess water during wet periods. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is moderately limited as a site for septic tank absorption fields because of the moderate permeability. Filling or mounding improves the ability of the field to absorb the effluent.

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

Sa—Saranac silty clay loam, gravelly substratum, frequently flooded. This nearly level, deep, very poorly drained soil is on flood plains. It is frequently flooded for brief periods during the winter and spring and is subject to ponding. Areas are 10 to 250 acres in size. Most are elongated and are parallel to streams.

In a typical profile, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer is black, mottled silty clay loam about 5 inches thick. The subsoil is gray and dark gray, mottled, very firm silty clay loam about 24 inches thick. The upper 11 inches of the underlying material is gray, mottled silty clay loam. The lower part to a depth of about 60 inches is gray gravelly coarse sandy loam. In places the content of gravel is less than 15 percent in the underlying material. In a few areas the underlying material is clay loam or silty clay to a depth of 60 inches. In some areas the subsoil contains less clay. In a few places the surface layer is mucky silt loam or muck.

Included with this soil in mapping are the very poorly drained Cohoctah soils and the somewhat poorly drained Ceresco soils. Cohoctah soils have a lower content of clay in the control section than the Saranac soil. They are in positions on the landscape similar to those of the

Saranac soil but are generally nearer to the streams. Ceresco soils are in the slightly higher landscape positions. Included soils make up about 10 percent of the map unit.

Permeability is moderately slow in the subsoil of the Saranac soil and moderately rapid in the underlying material. Available water capacity is high. The water table is near or above the surface during the winter and spring. Surface runoff is very slow or ponded. Organic matter content is high in the surface layer. This layer can be tilled only within a narrow range in moisture content.

Most areas are not drained and are used as pasture or woodland. A few are used for corn or soybeans. A few have small abandoned gravel pits. Because of the wetness and the flooding, this soil is generally unsuited to corn, soybeans, and hay. It is poorly suited to grasses and legumes for pasture. Reed canarygrass and Garrison creeping foxtail grow well. Overgrazing and grazing when the soil is wet are the main management concerns. They result in 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 poorly suited to trees. The equipment limitation, seedling mortality, plant competition, and the windthrow hazard are management concerns. Equipment should be used only during very dry periods or when the ground is frozen. Special site preparation, such as bedding, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding and the flooding, this soil is generally unsuitable as a site for dwellings. It is severely limited as a site for local roads because of the flooding, the ponding, and low strength. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by ponding and flooding. The base should be strengthened with suitable material. The soil is generally unsuitable as a site for septic tank absorption fields because of the ponding, the flooding, and the moderately slow permeability.

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

Sb—Saranac silty clay loam, gravelly substratum, occasionally flooded. This nearly level, deep, very poorly drained soil is on flood plains. It is occasionally flooded for brief periods during winter and spring and is subject to ponding. Areas are 10 to 300 acres in size. Most are elongated and are parallel to streams.

In a typical profile, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer also is black silty clay loam. It is about 7 inches thick. The subsoil is about 31 inches of gray and dark gray, mottled, very firm and firm silty clay loam and clay loam. The underlying material to a depth of about 60 inches is gray gravelly sandy loam. In a few places the underlying material is not gravelly within a depth of 60 inches. In some areas the subsoil has less clay. In a few places the surface layer is mucky silt loam or muck.

Included with this soil in mapping are the very poorly drained Cohoctah soils. These soils have less clay in the subsoil than the Saranac soil. They are in positions on the landscape similar to those of the Saranac soil but are generally nearer to the streams. They make up about 10 percent of the map unit.

Permeability is moderately slow in the subsoil of the Saranac soil and moderately rapid in the underlying material. Available water capacity is high. The water table is near or above the surface during the winter and spring. Surface runoff is very slow or ponded. Organic matter content is high in the surface layer. This layer can be tilled only within a narrow range in moisture content.

Nearly all areas of this soil are drained and are used for corn or soybeans. A few are used for hay, pasture, or woodland.

If drained, this soil is fairly well suited to corn and soybeans. The wetness is the main limitation. A surface drainage system is generally needed because the subsoil restricts the downward movement of water. Surface drains have been installed in areas where this soil is near Bowers Creek, which has been straightened and deepened. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth. The soil is well suited to fall plowing.

This soil is well suited to grasses and legumes, such as orchardgrass and clover, for hay and pasture. Overgrazing and grazing when the soil is wet are the main management concerns. They result in 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, plant competition, and the windthrow hazard are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding and the flooding, this soil is generally unsuitable as a site for dwellings. It is severely limited as a site for local roads because of the ponding, the flooding, and low strength. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by ponding and flooding. The base should be strengthened with suitable material. The soil is generally unsuitable as a site for septic tank absorption fields because of the flooding, the ponding, and the moderately slow permeability.

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

SdB—Shadeland silt loam, 1 to 4 percent slopes. This gently sloping, moderately deep, somewhat poorly drained soil is on bedrock terraces along Sugar Creek and its larger tributaries. Areas are irregularly shaped and are 3 to 10 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 24 inches thick. The upper part is dark yellowish brown, mottled, firm loam; the next part is grayish brown, mottled, firm clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. Weathered siltstone is at a depth of about 35 inches. In some places the depth to bedrock is more than 40 inches. In other places the lower part of the subsoil is silty clay. In some areas the entire solum formed in loamy outwash and is underlain by thin layers of gravelly outwash. In a few areas the soil is underlain by limestone.

Included with this soil in mapping are the well drained Ockley soils on the slightly higher rises. These soils have a bedrock substratum. Also included are very poorly drained soils in depressions. These soils have a surface layer that is darker than that of the Shadeland soil. Included soils make up about 10 percent of the map unit.

Permeability is moderately slow in the Shadeland soil. Available water capacity is moderate. The water table is at a depth of 1 to 2 feet during the winter and early spring. Surface runoff is medium. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas are used for corn, soybeans, pasture, or woodland. Subsurface drains have been installed in most of the areas used for corn or soybeans. This soil is well suited to corn, soybeans, and small grain. Erosion is a problem in the more sloping areas. The wetness is a limitation in the spring, and drought is a hazard during dry periods. Subsurface drains help to overcome the wetness. The bedrock, however, commonly hinders the installation of these drains and the lateral movement of water to the drainage tubing. Cropping systems that include grasses and legumes, diversions, and grassed waterways help to control erosion. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content.

This soil is fairly well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. A drainage system is needed in most areas. Overgrazing and grazing when the soil is wet are the main management concerns. They result in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. The depth to bedrock also is a severe limitation on sites for dwellings with basements. Perimeter subsurface drains help to overcome the wetness. In some areas the bedrock should be excavated before a basement is constructed. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness, the depth to bedrock, and the moderately slow permeability. Alternative sites should be selected.

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

Sf—Shoals silt loam, occasionally flooded. This nearly level, deep, somewhat poorly drained soil is on narrow flood plains. It is dominantly in the southwestern part of the county. It is occasionally flooded for brief periods during fall, winter, and spring. Areas generally are elongated and are 3 to 40 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The underlying material to a depth of about 60 inches is dark grayish brown and gray, mottled silt loam and loam. In a few places the subsoil is grayer. In some places loose sand is below a depth of 40 inches. In other places the underlying material contains more sand and less silt. In some areas firm glacial till is at a depth of 40 to 60 inches. In a few areas the surface layer is darker.

Included with this soil in mapping are the very poorly drained Washtenaw soils at the upper end of drainageways, the moderately well drained Beckville soils in narrow bands adjacent to streams, and areas of colluvial soils at the mouth of draws. The colluvial soils are subject to rare flooding. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Shoals soil. Available water capacity is high. The water table is at a depth of 0.5 foot to 1.5 feet during the winter and early spring. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are used as pasture or woodland. Some are drained and are used for corn or soybeans.

If drained, this soil is well suited to corn and soybeans. Because of the flooding, it is not well suited to crops seeded in the winter and early spring. The wetness and the flooding are the main management concerns. A drainage system of open ditches and subsurface drains has been established in some areas. A subsurface tile drainage system works well. Surface drains and tile drains installed at the base of the adjacent upland breaks sufficiently drain many areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

If drained, this soil is well suited to grasses and legumes, such as orchardgrass and clover, for hay and pasture. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in 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. The equipment limitation, seedling mortality, and plant competition are the main management concerns. Competing vegetation can be controlled by cutting, spraying, or girdling. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding, reduces the seedling mortality rate.

Because of the wetness and the flooding, this soil is generally unsuitable as a site for dwellings and for septic tank absorption fields. It is severely limited as a site for local roads because of the wetness, the flooding, and frost action. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate culverts and side ditches help to prevent the damage caused by frost action, wetness, and flooding.

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

SlA—Starks silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 48 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam, the next part is loam, and the lower part is silty clay loam. The underlying material to a depth of about 65 inches is yellowish brown, mottled, stratified silt loam and loamy fine sand. In a few places the solum is less than 40 inches thick. In a few areas the lower part of the solum formed in loam till. In a few places the subsoil contains more sand and less silt. In some areas the upper part of the subsoil is not mottled. In a few areas the content of gravel is as much as 20 percent in the lower part of the subsoil. In a few places glacial till is at a depth of about 40 inches.

Included with this soil in mapping are the very poorly drained Mahalasville soils in depressions and the well drained Ockley and Martinsville soils on rises. Ockley and Martinsville soils have a till substratum. Included soils make up about 10 percent of the map unit.

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

Nearly all areas of this soil are drained and are used for corn, soybeans, or small grain. Some are used as hayland, pasture, or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface tile drainage system works well. In many areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to grasses and legumes, such as orchardgrass and clover, for hay and pasture. A drainage system is needed. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in soil 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads on raised, well compacted fill material and providing side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is limited as a site for septic tank absorption fields because of the moderate permeability and the wetness. Perimeter interceptor subsurface drains help to overcome the wetness. Filling or mounding improves the ability of the field to absorb the effluent.

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

SrA—Starks-Crosby silt loams, 0 to 2 percent slopes. These nearly level, deep, somewhat poorly drained soils are on slight rises on till plains. The Starks soil is dominantly on the lower, less sloping parts of the landscape. The Crosby soil is dominantly on the higher, more sloping parts. Areas are irregularly shaped and are 3 to 500 acres in size. They are about 60 percent Starks soil and 35 percent Crosby soil. The two soils occur as areas so intricately mixed that mapping them separately was not practical.

In a typical profile of the Starks soil, the surface layer is brown silt loam about 11 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown, mottled, firm silty clay loam, and the lower part is dark yellowish brown, mottled, firm clay loam. The underlying material to a depth of about 60 inches is yellowish brown and brown, mottled silt loam that has thin strata of very fine sand. In some places the soil is not stratified. In other places the upper part of the subsoil contains more sand and less silt. In some areas firm till is as shallow as 45 inches.

In a typical profile of the Crosby soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 16 inches thick. The upper part is dark yellowish brown, mottled, firm silty clay loam, and the lower part is yellowish brown, mottled, firm clay loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In places the underlying material is sandy loam. In some eroded areas the surface layer is yellowish brown clay loam or loam. In a few areas the upper part of the subsoil is not mottled.

Included with these soils in mapping are areas of the very poorly drained Cyclone and Mahalasville soils. These included soils make up about 5 percent of the map unit.

Permeability is moderate in the Starks soil. It is slow in the subsoil of the Crosby soil and moderately slow in the underlying material. Available water capacity is high in the Starks soil and moderate in the Crosby soil. Runoff is slow on both soils. The water table is at a depth of 1 to 3 feet in the winter and early spring. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are drained and are used for corn or soybeans. Some are used for pasture, hay, or small grain. A few are wooded.

If drained, these soils are well suited to corn, soybeans, and small grain. The wetness is the main limitation. Subsurface drains and open ditches are needed. Tilling at the proper moisture content and applying a system of conservation tillage that leaves protective amounts of crop residue on the surface improve tilth and increase the organic matter content.

These soils are well suited to grasses and legumes, such as orchardgrass and clover, for hay and pasture. Grasses and legumes can be grown in some undrained areas, but a drainage system generally is beneficial. Overgrazing or grazing when the soil is too wet are the main management concerns. They result in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the wetness, these soils are severely limited as sites for dwellings. Subsurface and surface drains help to overcome this limitation. The soils are severely limited as sites for local roads and streets because of low strength and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action. The base should be strengthened with suitable material.

The Starks soil is limited as a site for septic tank absorption fields because of the wetness and the moderate permeability, and the Crosby soil is severely limited because of the wetness and the slow permeability. Perimeter interceptor subsurface drains help to lower the water table. Filling or mounding improves the ability of the field to absorb the effluent.

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

StB—St. Charles silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on moraines. Areas are irregularly shaped and are 3 to 80 acres in size.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 54 inches thick. In sequence downward, it is dark yellowish brown, strong brown, and brown, firm silty clay loam; strong brown and dark yellowish brown, firm and friable silt loam; brown, friable fine sandy loam; and dark yellowish brown, friable loam. The underlying material to a depth of about 70 inches is strong brown fine sandy loam. In places the silty material is more than 60 inches thick. In a few places glacial till is at a depth of about 50 inches. In a few areas mottles are at a depth of about 30 inches. In some areas sand and gravel are below a depth of 60 inches.

Included with this soil in mapping are the somewhat poorly drained Reesville soils in swales. Also included are the well drained Camden soils. These soils are in positions on the landscape similar to those of the St. Charles soil. They have less silt in the lower part of the solum than the St. Charles soil. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the St. Charles soil. Available water capacity is high. Surface runoff is medium. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are used for corn or soybeans. A few are used for small grain or hay.

This soil is well suited to corn, soybeans, and small grain. Erosion is the main management concern. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content and the rate of water infiltration. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. The base should be strengthened with suitable material. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The soil is suitable as a site for septic tank absorption fields.

The land capability classification is IIe. The woodland ordination symbol is 7A.

Su—Stonelick silt loam, occasionally flooded. This nearly level, deep, well drained soil is on flood plains. It is occasionally flooded for very brief periods during fall, winter, and spring. Areas are 3 to 75 acres in size. Most are elongated and parallel streams.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsurface layer also is dark brown silt loam. It is about 8 inches thick. The underlying material to a depth of about 60 inches is brown and dark yellowish brown fine sandy loam. In some places the surface layer is darker. In other places the depth to carbonates is more than 20 inches. In some areas the subsoil contains more clay. In a few places sand is at a depth of about 30 inches. In a few areas mottles are at a depth of about 30 inches. In a few places the subsoil contains more sand and less clay.

Included with this soil in mapping are the well drained Landes Variant soils on the slightly higher flood plains and the moderately well drained Beckville soils in swales. Included soils make up about 10 percent of the map unit.

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

Most areas of this soil are used for corn or soybeans. A few are used for pasture and hay. Small inaccessible areas and areas dissected by overflow channels are wooded.

This soil is well suited to corn and soybeans. Floodwater can damage crops seeded in the fall and early spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and clover, for hay and pasture. Floodwater can damage these crops in winter and early spring. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, girdling, or spraying.

Because of the flooding, this soil is severely limited as a site for dwellings and for septic tank absorption fields. Alternative sites should be selected. The soil also is severely limited as a site for local roads and streets because of the flooding. Building the roads on compacted fill material that raises the roadbed above flood levels helps to prevent the damage caused by flooding.

The land capability classification is IIw. The woodland ordination symbol is 7A.

Sv—Stonelick Variant fine sandy loam, frequently flooded. This nearly level, deep, well drained soil is on flood plains. It is frequently flooded for brief periods in the winter and spring. Areas are 3 to 30 acres in size. Most are elongated and parallel streams.

In a typical profile, the surface layer is very dark grayish brown fine sandy loam about 5 inches thick. The subsurface layer also is very dark grayish brown fine sandy loam. It is about 4 inches thick. The upper 32 inches of the underlying material is dark yellowish brown and brown, very friable loamy fine sand and loose loamy sand. The lower part to a depth of about 60 inches is brown gravelly coarse sand. In some places the surface layer is sand. In other places the soil contains less sand and more clay. In some areas in the western part of the county, the soil contains more gravel and cobbles and bedrock is as shallow as 30 inches. In places the surface layer is thicker.

Included with this soil in mapping are small areas of the moderately well drained Beckville soils in swales and drainageways. These soils make up about 5 percent of the map unit.

Permeability is moderately rapid in the upper part of the Stonelick Variant soil and very rapid in the lower part. Available water capacity is low. Surface runoff is slow. Organic matter content is low or moderately low in the surface layer. This surface layer can be tilled throughout a wide range in moisture content.

Most areas of this soil are wooded. A few are used for corn, soybeans, or pasture.

This soil is poorly suited to corn and soybeans. The flooding and droughtiness are the main management concerns. Because of the flooding, the soil is not well suited to crops seeded in the winter and early spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is fairly well suited to pasture grasses and legumes. Floodwater can damage the stand in winter and early spring. Overgrazing is the main management concern. It results in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, girdling, or spraying.

Because of the flooding, this soil is generally unsuitable as a site for dwellings, local roads and streets, and septic tank absorption fields. Alternative sites should be selected.

The land capability classification is IVw. The woodland ordination symbol is 10A.

TgA—Toronto silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on rises on till plains. Areas are irregularly shaped and are 3 to 80 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 45 inches thick. The upper part is light brownish gray, mottled, firm silty clay loam; the next part is yellowish brown, mottled, firm silty clay and silty clay loam; and the lower part is yellowish brown, mottled, firm loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some places the lower part of the subsoil has strata of coarser textured material. In other places the solum is less than 42 inches thick. In some areas the surface layer is lighter colored. In a few areas the dark surface layer is more than 10 inches thick. In places the subsoil contains more sand and less silt.

Included with this soil in mapping are the poorly drained Drummer soils in depressions and the somewhat poorly drained, stratified Millbrook soils. Millbrook soils are in positions on the landscape similar to those of the Toronto soil. Included soils make up about 10 percent of the map unit.

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

Nearly all areas of this soil are drained and are used for corn, soybeans, or small grain. Some are used for hay or pasture.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Subsurface drains and open ditches are needed. A subsurface tile drainage system works well. In many areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to grasses and legumes, such as orchardgrass and clover, for hay and pasture. A drainage system is generally needed. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. Unless drains around footings are properly installed, the dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Perimeter interceptor subsurface drains help to overcome the wetness. Filling or mounding improves the ability of the field to absorb the effluent.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Ty—Treaty silty clay loam. This nearly level, deep, very poorly drained soil is in depressions on till plains. It is frequently ponded by runoff from the adjacent soils. Areas range from 3 to 300 acres in size. They generally are irregularly shaped.

In a typical profile, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer also is black silty clay loam. It is about 4 inches thick. The subsoil is about 45 inches thick. The upper part is grayish brown, mottled, firm silty clay loam, and the lower part is gray, mottled, firm loam. The underlying material to a depth of about 70 inches is yellowish brown, mottled loam. In some places light colored material overlies the original black surface layer. In other places the lower part of the subsoil is silt loam, fine sand, sandy loam, or sand. In some areas the silty material is more than 40 inches thick. In a few areas the subsoil contains more clay. In places the surface layer and subsoil contain more sand and fine gravel.

Included with this soil in mapping are the somewhat poorly drained Crosby, Fincastle, and Starks soils on slight rises. These soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Treaty soil and moderately slow in the underlying material. Available water capacity is high. The water table is near or above the surface during the winter and early spring. Surface runoff is ponded or very slow. Organic matter content is high or moderate in the surface layer. This layer can become cloddy and hard to work if it is tilled when too wet. It can be tilled only within a narrow range in moisture content.

Most areas of this soil are drained and are used for corn, soybeans, or small grain. A few are used as hayland, pasture, or woodlots.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A drainage system of surface drains, subsurface drains, open ditches, or a combination of these has been established in most areas. A subsurface drainage system works well. In some areas open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth. The soil is well suited to fall plowing.

If drained, this soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet are the main management concerns. They result in compaction and poor tilth. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

This soil is 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. Special site preparation, such as bedding or furrowing before planting, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings. It is severely limited as a site for local roads because of the ponding, frost action, and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding. The base should be strengthened with suitable material. The soil generally is unsuitable as a site for septic tank absorption fields because of the ponding and the moderately slow permeability. Alternative sites should be selected.

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

Ud—Udorthents, loamy. These nearly level to strongly sloping, deep, well drained or moderately well drained soils are in disturbed areas near highway interchanges, shopping centers, and factories. In some places deep cuts have been made. The soil material from these cuts has been used to fill in lower lying areas and thus provide a smoother, more nearly level surface. In other places the soil material has been removed and used as fill for highway grades, overpasses, and exit ramps. Areas are 3 to 50 acres in size.

In a typical profile, the fill is a mixture of surface soil, subsoil, and underlying material. It is silt loam, loam, and clay loam that may contain some gravel, shale, or stones. In a typical area where a deep cut has been made, the material is mainly loam glacial till.

Included with these soils in mapping are small areas of short, steep slopes; areas of sand and gravel; areas where bedrock crops out; and areas where highways have been constructed. Also included, near urban areas, are some manmade dumps where rubble, treetops, and junk are covered with soil material.

Permeability is moderate to slow in the Udorthents. Available water capacity is low or moderate. Organic matter content is very low in the surface layer.

Because access to most areas is limited, these soils generally have a permanent cover of grasses and low-growing shrubs. In many areas they are surrounded by heavily traveled highways.

If these soils are used for crops, an intensive fertilization program is needed. This program should emphasize the incorporation of organic residue or manure into the soils. Measures that control erosion are needed in the more sloping areas. Examples are diversions, box inlet structures, grade stabilization structures, and grassed waterways. Exposed areas should be revegetated as soon as possible after construction. A drainage system may be needed in the nearly level areas.

Onsite investigation is needed if these soils are used for building site development. Engineering test data should be collected. The soil properties that affect the design of a structure vary from one place to another within a mapped area. Removing as little of the vegetation as possible and establishing a protective plant cover as soon as possible after construction help to control erosion.

The limitations that affect the use of these soils as sites for sanitary facilities vary. Onsite investigation is generally needed. Consideration should be given to wetness and permeability in the nearly level areas and to slope and permeability in the more sloping areas.

No land capability classification or woodland ordination symbol is assigned.

Wa—Wallkill silt loam. This nearly level, deep, very poorly drained soil is in potholes on moraines and till plains. It is periodically ponded by runoff from the adjacent soils. Areas are 2 to 25 acres in size. Most are oval, but a few are irregularly shaped.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The next layer is dark grayish brown and olive gray, mottled silt loam about 12 inches thick. Below this to a depth of about 60 inches is black and dark reddish brown muck. In some places coprogenous earth is below the mineral overwash. In a few places the mineral material overlying the organic material is loam or sandy loam. In some areas more than 40 inches of mineral material overlies the muck. In a few areas the surface layer is muck.

Included with this soil in mapping are the very poorly drained Milford soils. These soils have more clay in the control section than the Wallkill soil. They are in positions on the landscape similar to those of the Wallkill soil. They make up about 10 percent of the map unit.

Permeability is moderate in the mineral part of the Wallkill soil and moderately rapid in the organic part. Available water capacity is very high. The water table is near or above the surface during the winter and spring. Surface runoff is very slow or ponded. Organic matter content is moderately low or moderate in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are drained and are used for corn or soybeans. Several are not drained. Wetland weeds are the dominant vegetation in the undrained areas.

If drained, this soil is fairly well suited to corn and soybeans. Because of the ponding, it is poorly suited to small grain. A drainage system of surface and subsurface drains has been established in most areas. Surface inlet risers are generally needed. A drainage system is difficult to establish in some areas because of a lack of adequate outlets. Subsidence of the organic material is often a problem after a drainage system has been established. In a few areas pumps are used in conjunction with subsurface and surface drains. Diversions, conservation tillage, and grassed waterways on the higher surrounding soils minimize sedimentation and ponding on this soil. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content and the rate of water infiltration.

If drained, this soil is fairly well suited to grasses and legumes for hay or pasture. Grazing when the soil is too wet and overgrazing are the main management concerns. They result in 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 the windthrow hazard are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding or furrowing before planting, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Planting water-tolerant trees also helps to reduce the hazard of windthrow.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the ponding and frost action. Excavations to a depth of several feet or to suitable material and additions of such material as coarse gravel or crushed stone generally are needed. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is IIIw. The woodland ordination symbol is 3W.

Wb—Washtenaw silt loam, frequently flooded. This nearly level, deep, poorly drained soil is in depressions and on colluvial fans at the mouth of drainageways on till plains and moraines. It is frequently flooded for brief periods during the winter and spring and is subject to ponding. Areas are irregularly shaped and are 3 to 20 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. Below this is dark grayish brown, mottled silt loam about 17 inches thick. Next is a buried surface layer of very dark gray, firm silty clay loam about 8 inches thick and a buried subsoil of gray and dark gray, mottled, firm silty clay loam about 21 inches thick. The underlying material to a depth of about 60 inches is gray, mottled silt loam. In a few areas the surface layer is loam or sandy loam. In some places the buried soil does not have a dark layer. In other places stratified sand, sandy loam, and silt loam are at a depth of 50 to 60 inches. In some areas the overwash is only 10 inches thick. On some toe slopes, the soil is only rarely flooded. In some areas along the larger drainageways, the overwash is more than 40 inches thick. In places the soil is not mottled below the surface layer.

Included with this soil in mapping are the somewhat poorly drained Reesville soils on rises. Also included, in potholes, are a few areas that are ponded after heavy rains. Included soils make up about 5 percent of the map unit.

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

Most areas of this soil are drained and are used for corn or soybeans. A few are wet for long periods. Weeds and small trees are the dominant vegetation in these wet areas.

If drained, this soil is well suited to corn and soybeans. Because of the flooding and the wetness, it is poorly suited to small grain. A drainage system of open ditches, subsurface drains, surface drains, or a combination of these has been established in most areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing minimize compaction and help to maintain tilth and plant density.

This soil is 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. Special site preparation, such as bedding or furrowing before planting, reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil is generally unsuitable as a site for dwellings because of the ponding and flooding and as a site for septic tank absorption fields because of the slow permeability and the ponding and flooding. Alternative sites should be selected. The soil is severely limited as a site for local roads because of frost action and the ponding and flooding. Constructing the roads on well compacted fill material that raises the roadbed above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by flooding, ponding, and frost action. The base should be strengthened with suitable material.

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

WcA—Waupecan silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on outwash plains. Areas are irregularly shaped and are 3 to 85 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is about 61 inches thick. In sequence downward, it is dark yellowish brown, firm silt loam and silty clay loam; dark yellowish brown, firm loam; dark yellowish brown, firm gravelly coarse sandy loam and gravelly sandy clay loam; and dark reddish brown gravelly sandy clay loam. The underlying material to a depth of about 80 inches is yellowish brown gravelly coarse sand. In a few places the dark surface layer is thinner. In a few areas the lower part of the subsoil is mottled. In places, the underlying material occurs as a thin layer and loam till is as shallow as 65 inches.

Included with this soil in mapping are the somewhat poorly drained Brenton Variant soils on the lower rises and the very poorly drained Mahalasville soils in depressions. The Mahalasville soils have a gravelly substratum. Included soils make up about 10 percent of the map unit.

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

Nearly all areas of this soil are used for corn or soybeans. A few are used for wheat or hay.

This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing footings and foundations and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is suitable as a site for septic tank absorption fields.

The land capability classification is I. No woodland ordination symbol is assigned.

WdA—Waynetown silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on terraces and outwash plains. Areas are 3 to 50 acres in size. They generally are irregularly shaped, but most of those on terraces are elongated.

In a typical profile, the surface layer is dark brown silt loam about 10 inches thick. The subsurface layer is grayish brown, mottled, firm silt loam 4 inches thick. The subsoil is about 56 inches thick. The upper part is yellowish brown and grayish brown, mottled, firm silty clay loam, and the lower part is grayish brown, gray, and dark gray, mottled, firm loam and gravelly sandy clay loam. The underlying material to a depth of about 75 inches is dark gray gravelly coarse sand. In some places, the underlying material occurs as a thin layer and loam till is at a depth of about 65 inches. In other places the upper part of the subsoil contains more sand. In a few areas it is not mottled.

Included with this soil in mapping are the very poorly drained Mahalasville soils in depressions and the well drained Rush soils on the slightly higher rises. The Mahalasville soils have a gravelly substratum. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the subsoil of the Waynetown soil and rapid in the underlying material. Available water capacity is high. The water table is at a depth of 1 to 3 feet in the winter and early spring. Surface runoff is slow. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are drained and are used for corn, soybeans, or small grain. Some are used for hay and pasture. A few are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A system of subsurface drains and open ditches has been established in nearly all areas. A subsurface tile drainage system works well. In places open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

If drained, this soil is well suited to grasses and legumes, such as orchardgrass and clover, for hay and pasture. Overgrazing and grazing when the soil is too wet are the main management concerns. They result in 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. The main management concern is plant competition. Competing vegetation can be controlled by cutting, girdling, or spraying.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to overcome this limitation. Unless drains around footings are properly installed, the dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material. The soil is severely limited as a site for septic tank absorption fields because of the wetness. Subsurface perimeter interceptor drains help to overcome the wetness.

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

WeB—Wea silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on outwash plains and kames. Areas are irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 44 inches thick. The upper part is dark yellowish brown and brown, firm clay loam, and the lower part is brown, firm and friable gravelly loam and gravelly sandy loam. The underlying material to a depth of about 60 inches is yellowish brown gravelly coarse sand. In a few places the surface layer is sandy loam. In a few areas it is less than 10 inches thick. In some places the silty material is as much as 36 inches thick. In other places, the underlying material occurs as a thin layer and glacial till is at a depth of about 40 inches.

Included with this soil in mapping are the somewhat poorly drained Brenton Variant soils on the lower rises. These soils make up about 5 percent of the map unit.

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

Nearly all areas of this soil are used for corn or soybeans. Some are used for wheat. A few small areas have abandoned sand and gravel pits.

If erosion is controlled, this soil is well suited to corn, soybeans, and small grain. Erosion is the main management concern. It can be controlled by cropping systems that include grasses and legumes, by diversions, or by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content.

This soil is well suited to pasture grasses and legumes, including deep-rooted legumes, such as alfalfa. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing minimize compaction and help to maintain tilth and plant density.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Properly designing foundations and basement walls and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. The base should be strengthened with suitable material. The soil is suitable as a site for septic tank absorption fields.

The land capability classification is IIe. No woodland ordination symbol is assigned.

WfG—Weikert-Rock outcrop complex, 35 to 80 percent slopes. This map unit occurs as areas of a very steep, shallow, well drained Weikert soil intermingled with areas of Rock outcrop. The unit is on steep breaks along Sugar Creek and its tributaries in the southwestern part of the county. Areas are mostly elongated and are parallel to streams. They are 10 to 200 acres in size. They are about 45 percent Weikert soil and 40 percent Rock outcrop. The Weikert soil and Rock outcrop occur as areas so intricately mixed that mapping them separately was not practical.

In a typical profile of the Weikert soil, the surface layer is black channery loam about 4 inches thick. The subsoil is dark yellowish brown, friable channery loam about 11 inches thick. Pale brown, fractured sandstone bedrock is at a depth of about 15 inches. In a few places the content of coarse fragments in the surface layer is less than 15 percent. In a few areas the solum is as thin as 3 inches.

The Rock outcrop is dominantly very pale brown, fine grained sandstone and shale. In a few areas thin layers of limestone overlie the sandstone and shale.

Included in this unit in mapping are areas of the well drained Rodman soils on the upper part of the slopes and the moderately well drained Birkbeck and well drained Russell soils on ridgetops. Rodman soils do not have bedrock within a depth of 20 inches. Russell soils have a solum that is thicker than that of the Weikert soil. Also included are areas where slippage has occurred and a moderately deep soil has formed in a mixture of glacial till and residuum and areas where large chunks of bedrock have broken off and rolled down the slopes, creating irregular slope faces. Included soils make up about 15 percent of the map unit.

Permeability is moderately rapid in the Weikert soil. The Rock outcrop is impervious, except where water moves through the fractures. Available water capacity is very low in the Weikert soil. Surface runoff is very rapid on the Weikert soil and the Rock outcrop. Organic matter content is moderately low in the surface layer of the Weikert soil.

Nearly all areas of the Weikert soil are wooded. This unit is generally unsuited to cultivated crops, pasture, and hay because of the slope and droughtiness. The Weikert soil is poorly suited to trees. The equipment limitation and seedling mortality are severe, and the hazards of windthrow and erosion are moderate. Special logging methods, such as yarding the logs uphill with a cable, may be needed because of the equipment limitation and the erosion hazard. Planting containerized nursery stock reduces the seedling mortality rate. Because of the windthrow hazard, harvest methods should not isolate the remaining trees or leave them widely spaced.

The Weikert soil is generally unsuitable as a site for dwellings, local roads and streets, and septic tank absorption fields because of the slope and the depth to bedrock. Alternative sites should be selected.

The land capability classification is VIIe. The woodland ordination symbol assigned to the Weikert soil is 3R.

WkA—Whitaker silt loam, till substratum, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on slight rises on till plains and on moraines and small, low lying terraces. Areas are irregularly shaped and are 3 to 90 acres in size.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 42 inches thick. The upper part is dark yellowish brown, mottled, firm silty clay loam, and the lower part is yellowish brown, mottled, firm clay loam and sandy clay loam. The upper 4 inches of the underlying material is yellowish brown loamy fine sand. The lower part to a depth of about 60 inches is yellowish brown sandy loam. In a few places the surface layer and subsoil are loamy sand or sandy loam. In a few areas the subsoil is gravelly. In a few places glacial till is at a depth of about 35 inches. In a few areas the silty material is more than 24 inches thick. In a few places the lower part of the subsoil formed in loam glacial till. In some areas the upper part of the subsoil is not mottled.

Included with this soil in mapping are the somewhat poorly drained Crosby soils. These soils are in positions on the landscape similar to those of the Whitaker soil. They have more clay in the subsoil than the Whitaker soil. Also included are the very poorly drained Mahalasville soils in depressions. Included soils make up about 10 percent of the map unit.

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

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface drainage system works well. In some places open ditches are needed for use as tile drainage outlets. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

If drained, this soil is well suited to pasture grasses and legumes. Overgrazing and grazing when the soil is wet are the main management concerns. They result in 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 main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, and girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains help to lower the water table. Unless drains around footings are properly installed, the buildings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of frost action. The base should be strengthened with suitable material. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The soil is severely limited as a site for septic tank absorption fields because of the wetness. Perimeter interceptor subsurface drains help to lower the water table.

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

XgB2—Xenia-Birkbeck silt loams, 2 to 6 percent slopes, eroded. These gently sloping, deep, moderately well drained soils are on rises and along drainageways on till plains and moraines. The Xenia soil is typically on the more sloping back slopes and shoulder slopes. The Birkbeck soil is on the less sloping foot slopes and summits. It is the dominant soil in some wooded areas. Areas are irregularly shaped and are 3 to 150 acres in size. They are about 55 percent Xenia soil and 40 percent Birkbeck soil. The two soils occur as areas so intricately mixed or so small that mapping them separately was not practical.

In a typical profile of the Xenia soil, the surface layer is yellowish brown silt loam about 9 inches thick. The subsoil is about 36 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the next part is dark yellowish brown, mottled, firm silty clay loam; and the lower part is dark yellowish brown and yellowish brown, mottled, firm clay loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some of the most eroded areas, the surface layer and the entire subsoil are loam or clay loam.

In a typical profile of the Birkbeck soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 50 inches thick. It is yellowish brown. In sequence downward, it is friable silt loam; firm silty clay loam; mottled, firm silt loam; and mottled, firm loam. The underlying material to a depth of about 66 inches is yellowish brown loam. In some areas the loess is more than 60 inches thick. In many places the surface layer contains more clay. In a few places the underlying material is stratified sandy loam and silt loam. In areas on toe slopes where overwash has been deposited, the surface layer is thick. In some areas on narrow ridgetops, the soil is mottled.

Included with these soils in mapping are the somewhat poorly drained Fincastle and Reesville soils on the less sloping summits and in swales and drainageways and the well drained Miami soils on rises and breaks. Also included are narrow areas of the very poorly drained Ragsdale soils in drainageways. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the Birkbeck soil and moderately slow in the Xenia soil. Available water capacity is high in both soils. The water table is at a depth of 2 to 6 feet in the Xenia soil during the winter and early spring and is at a depth of 3 to 6 feet in the Birkbeck soil during the winter and spring. Surface runoff is medium on both soils. Organic matter content is moderately low in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Nearly all areas of these soils are used for corn, soybeans, small grain, or hay. A few are used as pasture or woodlots.

If erosion is controlled, these soils are well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be controlled by cropping systems that include grasses and legumes, by diversions, and by grassed waterways. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to control erosion, improves tilth, and increases organic matter content.

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and pasture. Overgrazing is the main management concern. It results in compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to trees. The main management concern is plant competition. Competing vegetation can be controlled by cutting, spraying, or girdling.

The Birkbeck soil is moderately limited as a site for dwellings because of the shrink-swell potential. On sites for dwellings with basements, the wetness also is a moderate limitation. The Xenia soil is moderately limited as a site for dwellings without basements because of the wetness and the shrink-swell potential and is severely limited as a site for dwellings with basements because of the wetness. Installing perimeter drain tile around foundations helps to overcome the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling.

These soils are severely limited as sites for local roads and streets because of low strength and frost action. Constructing the roads on well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. The base should be strengthened with suitable material.

These soils are severely limited as sites for septic tank absorption fields because of the wetness. The moderately slow permeability of the Xenia soil also is a severe limitation. Perimeter interceptor subsurface drains help to overcome the wetness. Filling or mounding improves the ability of the field to absorb the effluent.

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 285,000 acres in the survey area, or 88 percent of the total acreage, meets the soil requirements for prime farmland. Nearly all of this prime farmland is used for crops. The crops grown on this land, mainly corn and soybeans, account for most of the county's total agricultural income each year.

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 and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have 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

Steven R. Woll, 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.

More than 252,959 acres in the survey area was used for crops and pasture in 1982. Of this acreage, 131,784 acres was used for corn; 82,967 acres for soybeans; 19,460 acres for rotation hay and pasture; and 10,485 acres for close-grown crops, mainly wheat and oats. The rest was idle cropland or was used for conservation purposes (*8*).

Much of the farmland in Montgomery County is managed so that it reaches its full potential. About 11,000 acres of potentially good cropland is used as woodland and about 1,600 acres as pasture. This land represents a reserve productive capacity. Food production could also be increased by extending the latest crop production technology to all of the cropland in the county. Information in this soil survey can facilitate the application of such technology.

As part of the PL-566 program, drainage and flood-control measures were established in the Lye Creek watershed, in the north-central part of the county, and the Little Raccoon Creek watershed, in the southwestern part. The Lye Creek project was primarily drainage work. The Little Raccoon Creek project included construction of a lake used for flood control and recreation. Erosion-control and drainage measures are still needed in many areas of the county. The paragraphs that follow describe the major management concerns on the cropland and pasture in the county.

Wetness is the major problem on about 59 percent of the cropland and pasture in the county. Most farmed areas of the poorly drained and very poorly drained Belleville, Cohoctah, Cyclone, Drummer, Mahalasville, Milford, Milford Variant, Ragsdale, Saranac, Treaty, and Washtenaw soils are drained. In many areas, however, tile repair and replacement are needed. A surface drainage system also is needed. These soils make up about 72,978 acres in the county. A few areas of these soils, especially Milford and Milford Variant soils, are in low depressions and cannot be economically drained.

The very poorly drained Muskego, Palms, and Wallkill soils are difficult to drain because they are in low depressions. In many areas they are not adequately drained. They make up about 1,778 acres in the county.

Unless drained, the somewhat poorly drained Brenton, Brenton Variant, Ceresco, Crosby, Fincastle, Millbrook, Millbrook Variant, Raub, Reesville, Shadeland, Shoals, Starks, Waynetown, and Whitaker soils are so wet that crops are damaged in most years. These soils make up about 116,755 acres in the county. The moderately well drained Beckville, Bowes, Birkbeck, Lobdell, Proctor, Rush Variant, and Xenia soils and the well drained Miami, Parr, and Octagon soils are adequately drained most of the year, but they often dry out slowly after a rain. Small areas of somewhat poorly drained soils along drainageways and in swales are commonly included with these soils in mapping, especially in areas where the slope is 2 to 6 percent. A drainage system is needed in some of these wetter areas.

Alford, Boyer, Camden, Casco, Chagrin, Jasper, Landes Variant, Martinsville, Ockley, Ormas, Proctor, Rush, Russell, Stonelick, Stonelick Variant, and Waupecan soils are well drained. They dry out fairly quickly after a rain.

The design of surface and subsurface drainage systems varies, depending on the kind of soil. A combination of surface and subsurface drain is needed in most areas of the poorly drained and very poorly drained soils used for intensive row cropping. A subsurface drainage system is needed in the somewhat poorly drained soils. Subsurface tile drains should be more closely spaced in slowly permeable soils than in the more rapidly permeable soils. Subsurface drainage is slow in Milford soils.

Because organic soils oxidize and subside when their pore spaces fill with air, special drainage systems are needed to control the depth to the water table and the period of drainage. Keeping the water table at the level required by the crops during the growing season and allowing it to rise to the surface during the rest of the year minimize the oxidation and subsidence of these soils. Pumping systems help to control the water table.

Further information about the drainage measures needed on each kind of soil is available in local offices of the Soil Conservation Service.

Water erosion is the major management concern on about 29 percent of the cropland and pasture in the county. If the slope is more than 2 percent, erosion is a hazard. Loss of the surface layer through erosion reduces the productivity of the soil and results in the pollution of streams by chemicals and soil material. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Controlling erosion and sedimentation minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

In severely eroded spots in many sloping fields, a good seedbed cannot be easily prepared by conventional methods because the friable surface layer has been eroded away. Such spots are common in areas of Miami, Octagon, Parr, and Xenia soils. Cultivating the glacial till exposed in some of the most severely eroded areas is very difficult.

Cropping systems that maintain a vegetative cover reduce the hazards of runoff and erosion and increase the rate of water infiltration. On livestock farms, where pasture and hay are needed, including grasses and legumes in the cropping sequence helps to control erosion in the more sloping areas, increases the supply of nitrogen, and improves tilth. Orchardgrass, bromegrass, and timothy are grown on well drained soils, such as Alford, Boyer, Camden, Martinsville, Miami, Ockley, and Russell soils. These soils are well suited to legumes, such as alfalfa and red clover. On poorly drained and very poorly drained soils, such as Belleville, Cyclone, Drummer, Mahalasville, Milford, Pella, and Ragsdale soils, reed canarygrass and legumes, such as alsike clover and ladino clover, are grown.

In sloping areas where row crops are grown year after year, systems of conservation tillage that leave a maximum amount of crop residue on the surface for extended periods reduce the hazard of erosion. These systems are suited to all of the sloping soils in the county. Examples of conservation tillage are no-till and ridge-till planting.

No-till planting not only helps to control erosion but also reduces the expense of tillage. Where this system is applied, the field is not tilled when the crops are planted. Weeds are controlled by herbicides. No-till is best suited to well drained soils, such as Alford and Rush, but it also is suited to moderately well drained soils, such as Birkbeck and Xenia. Gently sloping, somewhat poorly drained soils, such as Crosby and Fincastle, are suited to no-till if the wetter areas are drained. Nearly level, somewhat poorly drained soils, such as Reesville and Starks, are poorly suited to no-till. If an adequate drainage system is maintained, however, no-till systems can be applied.

Poorly drained and very poorly drained soils, such as Drummer and Treaty, are well suited to ridge-till planting. Also, nearly level, somewhat poorly drained soils, such as Raub and Starks, are suited to this system. Where this system is applied, the crop is planted on ridges that were built up by cultivation during the previous growing season. The field is not tilled before the crop is planted. The ridge-till system can be used on nearly level soils of all drainage classes. The erosion-control value of this system on rolling land has not been determined.

Organic soils, such as Muskego and Palms, are poorly suited to ridge-till and no-till planting because of poor stability and the need for weed control.

Parallel tile-outlet terraces, diversions, contour farming with or without terraces, and grassed waterways can be effective in controlling erosion. In most parts of the county, slopes are so short and irregular that contour farming is not practical. An exception is the west-central part, which has a morainal topography. In this part of the county, such soils as St. Charles, Birkbeck, and Xenia can be farmed on the contour. In other areas of the county, diversions and parallel tile-outlet terraces can reduce the hazard of erosion. They are most practical on deep, well drained soils. Terracing reduces soil loss and the associated loss of fertilizer elements, helps to eliminate the need for grassed waterways in some areas, and makes farming of sloping soils easier. Most of the sloping, well drained soils are suitable for parallel tile-outlet terraces. Boyer soils, which have sand and gravel within a depth of 40 inches, are less well suited to terraces and diversions than other soils.

Grassed waterways are needed in many areas of sloping soils, such as Ockley and Russell soils. They also are needed in many of the more sloping areas of somewhat poorly drained to very poorly drained soils (fig. 11). Many areas of Miami and Xenia soils are seepy along drainageways. Subsurface tile should be installed in the waterways on the wetter soils.

Because of the large number of open ditches in the county, many grade stabilization structures and surface water pipes are needed. Grade stabilization structures help to control erosion where surface water drains into an open ditch. They commonly are needed in open ditches where the grade is too steep and the water moves so rapidly that it erodes the sides and bottom of some channels. Riprap commonly is needed to control streambank erosion, particularly in areas of Brenton, Mahalasville, Millbrook, Saranac, Starks, and Waynestown soils, which have coarse textured strata in the underlying material.

Soil blowing is a hazard on organic soils, such as Muskego and Palms. It also occurs on dark mineral soils, such as Drummer and Mahalasville, if they have no vegetative cover and are very dry. The soils can be damaged in a few hours if winds are strong and the soils are dry and lack vegetation or surface mulch. Maintaining a cover of vegetation or surface mulch or applying tillage methods that result in a rough surface minimizes soil blowing (fig. 12). Windbreaks of adapted shrubs, such as Amur honeysuckle and autumn-olive, are effective in controlling soil blowing on the organic soils.

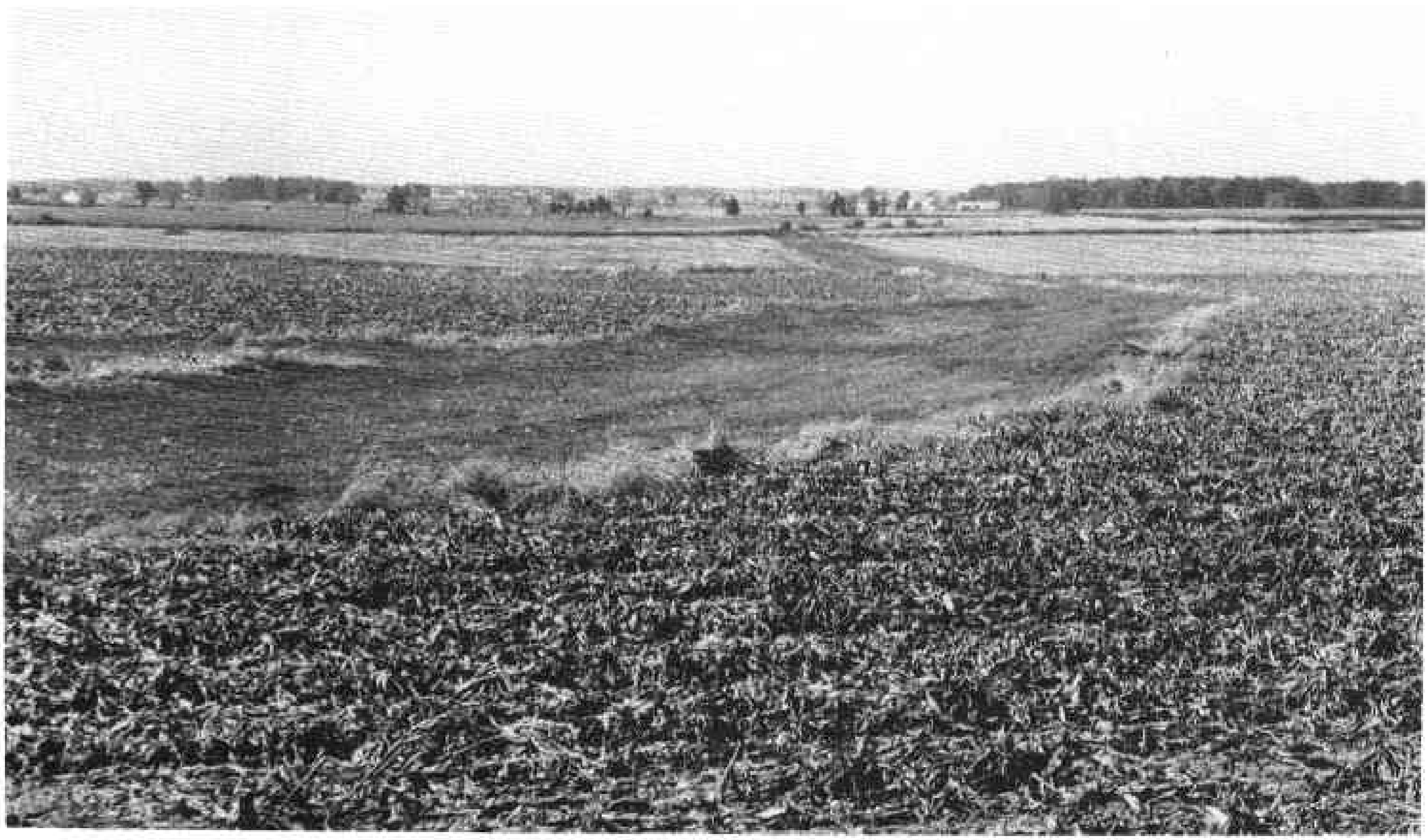


Figure 11.—A grassed waterway that carries excess water from sloping soils across an area of the nearly level Starks and Mahalasville soils, which are in the background.

Figure 12.—An area of a Mahalasville soil that has been chisel plowed. Chisel plowing results in a rough surface and thus helps to control soil blowing.

Soil fertility is high or moderate in most of the depressional soils on uplands and terraces in the county. The poorly drained and very poorly drained Cohoctah, Cyclone, Drummer, Mahalasville, Milford, Milford Variant, Palms, Patton, Ragsdale, Saranac, Treaty, Wallkill, and Washtenaw soils generally are neutral or slightly acid. These soils are in slight depressions and receive runoff from the adjacent upland soils. Soils on flood plains, such as Beckville and Stonelick, are neutral or mildly alkaline and are naturally more fertile than most of the soils on uplands and terraces. Most of the soils that formed under prairie vegetation in the northern part of the county are slightly more fertile than the soils in the rest of the county.

Somewhat poorly drained to well drained soils on rises on uplands and terraces generally are lower in natural fertility and more acid than dark, poorly drained and very poorly drained soils in depressions. On all soils additions of lime and fertilizer should be based on the results of soil tests. 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 and emergence of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. Mainly because of a high organic matter content, tilth generally is best in the less clayey soils that have a dark surface layer, such as Brenton, Cohoctah, Raub, and Waupecan soils. Organic matter content also is high in the poorly drained and very poorly drained soils that have a dark surface layer. In many areas, however, the content of clay in this surface layer hinders tillage.

Many of the soils used for crops have a surface layer of silt loam that is light in color and low or moderately low in organic matter content. Generally, the structure of these soils is such that a surface crust forms during periods of heavy rainfall. When dry, this crust is hard. As a result, it reduces the rate of water infiltration and increases the runoff rate. Regular additions of crop residue, manure, and other organic material improve soil structure and minimize crusting. The soils that have a dark surface layer do not crust so readily as similarly textured soils that have a light colored surface layer.

The dark Cyclone, Drummer, Mahalasville, Milford, Milford Variant, Pella, Saranac, and Treaty soils have a high content of clay and of organic matter in the surface layer. Tilth is a problem in many years because the soils often stay wet until late in spring. If plowed when wet, these soils become very cloddy when dry. Because of the cloddiness, preparing a good seedbed is difficult. Chiseling or plowing during dry periods in the fall generally results in good tilth the following spring.

Soil structure is adversely affected by plowing when the soil is wet. A chisel plow can be used as an alternative to a moldboard plow during dry periods in the fall. Chiseling rather than moldboard plowing results in less erosion and soil blowing in winter and early in spring.

The main *row crops* in the county are corn and, to an increasing extent, soybeans. Wheat and oats are the main close-growing crops. Some seed corn is grown in the county.

Specialty crops, such as vegetables and small fruits, are especially well suited to deep, well drained soils that warm up early in spring. In Montgomery County these are the Alford, Camden, Landes Variant, Martinsville, Ockley, Ormas, Proctor, Rush, St. Charles, Waupecan, and Wea soils that have a slope of less than 6 percent. These soils make up about 40,338 acres in the county. Crops can generally be planted and harvested earlier on these soils than on the other soils in the county.

If drained, the organic Muskego and Palms soils are well suited to a wide range of vegetable crops. These soils make up about 1,540 acres in the county.

Most of the well drained soils in the county are suitable for orchards and nursery plants. Soils in low areas 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

Michael D. Warner, forester, Soil Conservation Service, helped prepare this section.

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 recreational facilities in the county include Shades State Park, which is 16 miles southwest of Crawfordsville. This park has deep sandstone gorges and has trails through virgin woods. Pine Hill Nature Preserve is near Shades State Park. Sugar Creek, which crosses the county, provides a popular course for canoeists.

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

James D. McCall, biologist, Soil Conservation Service, helped prepare this section.

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 orchardgrass, timothy, 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, 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 maple, beech, oak, hickory, poplar, cherry, willow, black walnut, apple, hawthorn, dogwood, hazelnut, elderberry, and blackberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive, crabapple, and shrub dogwood.

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 cattail, smartweed, waterplantain, wild millet, spikerush, arrowhead, 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, dove, pheasant, killdeer, meadowlark, field sparrow, cottontail, red fox, woodchuck, and coyote.

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 wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of 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

Max L. Evans, state conservation engineer, Soil Conservation Service, helped prepare this section.

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, 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, 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, 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, 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.

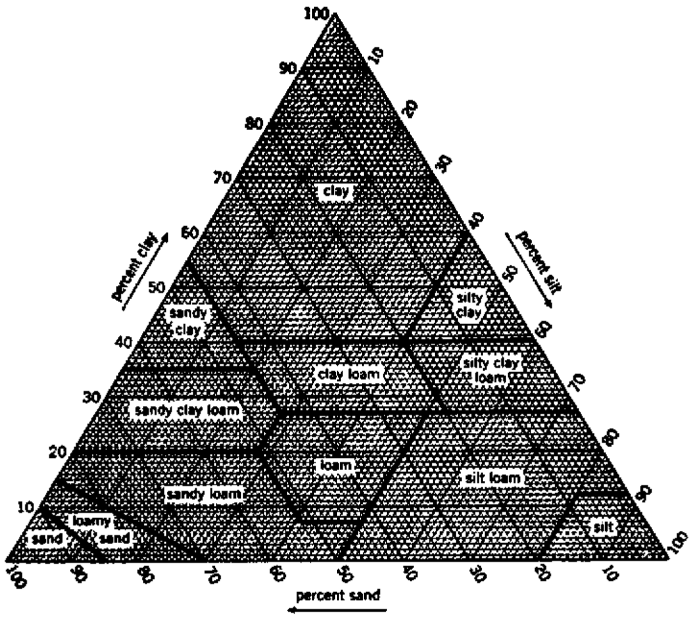


Figure 13.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

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. 13). "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 (*6*). 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 Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has 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* (*5*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*6*). 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."

Alford Series

The Alford series consists of deep, well drained, moderately permeable soils on terraces and outwash plains. These soils formed in silty material. Slopes range from 0 to 2 percent.

These soils have a lower base saturation in the control section than is definitive for the Alford series. This difference, however, does not alter the usefulness or behavior of the soils.

Alford soils are similar to St. Charles soils and are commonly near Reesville and Rush soils. The lower part of St. Charles soils formed in stratified, loamy outwash.

Reesville soils have a mottled subsoil. They are in the lower positions on the landscape. Rush soils are in landscape positions similar to those of the Alford series. The lower part of their solum formed in loamy outwash.

Typical pedon of Alford silt loam, 0 to 2 percent slopes, in a cultivated field; 1,350 feet west and 920 feet north of the southeast corner of sec. 9, T. 18 N., R. 5 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; medium fine and very fine granular structure; friable; strongly acid; clear smooth boundary.

Bt1—9 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure parting to weak fine granular; friable; common roots; common pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings when dry; strongly acid; gradual smooth boundary.

Bt2—17 to 29 inches; strong brown (7.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; few roots; common pores; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; thin discontinuous dark grayish brown (10YR 4/2) manganese and iron oxide stains on faces of peds; very strongly acid; gradual wavy boundary.

Bt3—29 to 41 inches; strong brown (7.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; common pore; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; discontinuous dark grayish brown (10YR 4/2) manganese and iron oxide stains on faces of peds; very strongly acid; clear smooth boundary.

Bt4—41 to 55 inches; brown (7.5YR 4/4) silt loam; weak coarse subangular blocky structure; firm; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; discontinuous pale brown (10YR 6/3) silt coatings when dry; very strongly acid; gradual smooth boundary.

C—55 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; massive; friable; slight increase in content of very fine sand and fine sand; very strongly acid.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It ranges from extremely acid to medium acid. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4.

Beckville Series

The Beckville series consists of deep, moderately well drained, moderately rapidly permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Beckville soils are similar to Stonelick soils and are commonly near Cohoctah and Stonelick soils. Stonelick soils do not have mottles within a depth of 30 inches. They are in the higher landscape positions. Cohoctah soils are in lower swales and drainageways. Their surface layer is darker and thicker than that of the Beckville soils, and their subsoil is grayer.

Typical pedon of Beckville loam, occasionally flooded, in a cultivated field; 600 feet east and 2,350 feet south of the northwest corner of sec. 32, T. 19 N., R. 3 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common fine roots; mildly alkaline; abrupt smooth boundary.

C1—11 to 21 inches; brown (10YR 4/3) loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium granular structure; friable; few thin dark brown (10YR 3/3) coatings; neutral; clear wavy boundary.

C2—21 to 28 inches; brown (10YR 4/3) sandy loam; common medium faint grayish brown (10YR 5/2) mottles; weak fine granular structure; friable; few fine roots; neutral; clear smooth boundary.

C3—28 to 44 inches; dark grayish brown (10YR 4/2) loam; many medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; slight effervescence; mildly alkaline; clear smooth boundary.

C4—44 to 60 inches; grayish brown (10YR 5/2) sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; very friable; 10 percent gravel; strong effervescence; moderately alkaline.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. The upper part of the C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, sandy loam, or fine sandy loam. It has a gravel content of 0 to 5 percent. It is neutral or mildly alkaline. The lower part has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or sandy loam. It has a gravel content of 5 to 15 percent. It is neutral to moderately alkaline.

Belleville Series

The Belleville series consists of deep, very poorly drained soils in depressions and potholes on moraines and till plains. These soils formed in sandy material overlying silty lacustrine deposits. Permeability is rapid in the sandy material and moderately slow in the underlying material. Slopes range from 0 to 2 percent.

Belleville soils are commonly near Milford and Wallkill soils. Milford soils have a solum that formed entirely in silty and clayey deposits. They are in positions on the landscape similar to those of the Belleville soils. Wallkill soils formed in silty alluvium overlying organic deposits. They are in the lower lying potholes.

Typical pedon of Belleville loamy sand, in a cultivated field; 660 feet west and 1,700 feet south of the northeast corner of sec. 6, T. 18 N., R. 5 W.

Ap—0 to 11 inches; black (10YR 2/1) loamy sand, gray (10YR 5/1) dry; weak very fine granular structure; very friable; many roots; slightly acid; abrupt smooth boundary.

Cg1—11 to 23 inches; gray (10YR 5/1) sand; few medium distinct yellowish brown (10YR 5/4) and few medium faint gray (10YR 6/1) mottles; single grain; loose; common roots; thin discontinuous dark grayish brown (10YR 4/2) iron and manganese oxide stains; slightly acid; gradual smooth boundary.

Cg2—23 to 30 inches; light brownish gray (10YR 6/2) sand; many coarse faint pale brown (10YR 6/3) and few fine distinct yellowish brown (10YR 5/4) mottles; single grain; loose; common roots; many dark grayish brown (10YR 4/2) iron and manganese oxide stains at a depth of 28 to 30 inches; slightly acid; abrupt smooth boundary.

2Cg3—30 to 45 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; common roots; few pores; thin discontinuous gray (10YR 5/1) coatings lining pores and on faces of peds; few thin strata of sand; slightly acid; gradual wavy boundary.

2Cg4—45 to 60 inches; gray (10YR 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; firm; neutral.

Reaction is slightly acid or neutral in the A and Cg horizons and neutral to moderately alkaline in the 2Cg horizon. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It ranges from loamy fine sand to sand. The Cg and 2Cg horizons have hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The Cg horizon is sand, loamy sand, or loamy fine sand. The content of clay in the 2Cg horizon is 35 to 40 percent. In some pedons this horizon has carbonates.

Birkbeck Series

The Birkbeck series consists of deep, moderately well drained, moderately permeable soils on till plains and moraines. These soils formed in loess and in the underlying till. Slopes range from 2 to 6 percent.

Birkbeck soils are commonly near Fincastle, Ragsdale, Reesville, and Xenia soils. Fincastle and Reesville soils have mottles directly below the surface layer. They are on the lower rises. Ragsdale soils have a dark surface layer. They are in depressions. Xenia soils are mottled in the upper part of the subsoil. They are in positions on the landscape similar to those of the Birkbeck soils.

Typical pedon of Birkbeck silt loam, in a cultivated area of Xenia-Birkbeck silt loams, 2 to 6 percent slopes, eroded; 630 feet east and 2,080 feet south of the northwest corner of sec. 4, T. 17 N., R. 5 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; few splotches of yellowish brown (10YR 5/4) subsoil material; strongly acid; clear smooth boundary.

BE—10 to 16 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure parting to moderate medium granular; friable; common roots; many pores; strongly acid; gradual smooth boundary.

Bt1—16 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; few roots; few pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin continuous light yellowish brown (10YR 6/4) silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—25 to 36 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) iron and manganese oxide stains on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—36 to 48 inches; yellowish brown (10YR 5/6) silt loam; few medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin continuous pale brown (10YR 6/3) silt coatings on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) iron and manganese oxide stains on faces of peds; very strongly acid; gradual smooth boundary.

Bt4—48 to 55 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) manganese and iron oxide stains on faces of peds; slightly acid; gradual smooth boundary.

2Bt5—55 to 60 inches; yellowish brown (10YR 5/6) loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films and iron and manganese oxide coatings on faces of peds; mildly alkaline; gradual smooth boundary.

2C—60 to 66 inches; yellowish brown (10YR 5/4) loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 44 to 70 inches thick. The loess is 40 to 60 inches thick. The depth to mottles ranges from 24 to 48 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is loam or clay loam. It is slightly acid to mildly alkaline.

Bowes Variant

The Bowes Variant consists of deep, moderately well drained soils on outwash plains. These soils formed in silty material and in the underlying loamy outwash. Permeability is moderate in the subsoil and rapid in the underlying material. Slopes range from 0 to 2 percent.

Bowes Variant soils are similar to Rush Variant soils and are commonly near Millbrook Variant and Waupecan soils. Rush Variant soils have a surface layer that is lighter colored than that of the Bowes Variant soils. Millbrook Variant soils have a subsoil that is grayer than that of the Bowes Variant soils. They are on the slightly lower rises. Waupecan soils have a surface layer that is thicker than that of the Bowes Variant soils and do not have mottles in the solum. They are on the higher rises.

Typical pedon of Bowes Variant silt loam, 0 to 2 percent slopes, in a cultivated field; 660 feet east and 790 feet north of the southwest corner of sec. 15, T. 20 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure parting to weak fine granular; firm; many fine roots; common fine pores; thin discontinuous very dark grayish brown (10YR 3/2) clay films and organic coatings; very strongly acid; clear smooth boundary.

Bt2—15 to 23 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; common fine roots; common fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; gradual wavy boundary.

Bt3—23 to 29 inches; dark yellowish brown (10YR 4/6) silty clay loam; few fine prominent grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; thin discontinuous brown (10YR 4/3) clay films on faces of peds; few clean sand grains; very strongly acid; clear smooth boundary.

2Bt4—29 to 36 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; many medium prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin continuous gray (10YR 5/1) clay films on faces of peds; about 15 percent gravel; very strongly acid; clear smooth boundary.

2Bt5—36 to 44 inches; dark yellowish brown (10YR 4/6) gravelly sandy loam; many medium prominent gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin discontinuous gray (10YR 5/1) clay films on faces of peds; about 15 percent gravel; strongly acid; gradual smooth boundary.

2Bt6—44 to 50 inches; dark yellowish brown (10YR 4/6) gravelly sandy clay loam; many medium prominent gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on faces of peds; about 15 percent gravel; strongly acid; clear smooth boundary.

2Bt7—50 to 60 inches; grayish brown (10YR 5/2) gravelly sandy clay loam; many medium prominent dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; thin discontinuous gray (10YR 5/1) clay films on faces of peds; about 22 percent gravel; medium acid; clear smooth boundary.

2C—60 to 66 inches; grayish brown (10YR 5/2) gravelly coarse sand; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum is 50 to 70 inches thick. The silty material is 28 to 45 inches thick.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. It is very strongly acid to medium acid. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 6. It is clay loam, sandy clay loam, loam, sandy loam, or the gravelly analogs of these textures. The 2C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The content of gravel in this horizon ranges from 15 to 50 percent, and the content of material finer textured than very fine sand ranges from 5 to 20 percent.

Boyer Series

The Boyer series consists of well drained soils on terrace breaks. These soils formed in loamy outwash over sandy and gravelly outwash. They are moderately deep over gravelly coarse sand. Permeability is moderately rapid in the subsoil and very rapid in the underlying material. Slopes range from 6 to 15 percent.

Boyer soils are similar to Casco and Rodman soils and are commonly near Ockley and Rush soils. Casco, Ockley, and Rush soils have more clay in the subsoil than the Boyer soils, and Rodman soils have less clay in the subsoil. Also, Ockley and Rush soils have a thicker solum. They are in the less sloping areas.

Typical pedon of Boyer gravelly sandy loam, 6 to 15 percent slopes, severely eroded, in a cultivated field; 1,850 feet west and 2,240 feet south of the northeast corner of sec. 21, T. 19 N., R. 4 W.

Ap—0 to 6 inches; dark yellowish brown (10YR 3/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) dry; weak medium subangular blocky structure; firm; about 30 percent gravel; neutral; clear smooth boundary.

Bt1—6 to 15 inches; dark reddish brown (5YR 3/4) gravelly coarse sandy loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous dark reddish brown (5YR 3/2) clay films on faces of peds; about 30 percent gravel; neutral; clear wavy boundary.

Bt2—15 to 26 inches; dark reddish brown (5YR 3/4) gravelly sandy loam; weak medium subangular blocky structure; firm; few fine roots; common thin dark reddish brown (5YR 3/2) clay films on faces of peds; about 20 percent gravel; mildly alkaline; clear wavy boundary.

Bt3—26 to 29 inches; dark brown (7.5YR 4/4) gravelly loamy sand; weak fine subangular blocky structure; very friable; few fine roots; few thin dark brown (7.5YR 3/2) clay films bridging sand grains; about 30 percent gravel; moderately alkaline; clear irregular boundary.

C—29 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; about 20 percent gravel; strong effervescence; mildly alkaline.

The solum is 20 to 40 inches thick. The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is gravelly loam or gravelly sandy loam. The content of gravel in this horizon ranges from 15 to 30 percent. The Bt horizon has hue of 5YR to 10YR and value and chroma of 3 or 4. It is loam, sandy loam, sandy clay loam, loamy sand, or the gravelly analogs of these textures. The content of gravel in this horizon ranges from 10 to 35 percent. The C horizon ranges from very gravelly coarse sand to gravelly sand.

Brenton Series

The Brenton series consists of deep, somewhat poorly drained, moderately permeable soils on till plains. These soils formed in silty material and in the underlying loamy and silty glaciofluvial deposits. Slopes range from 0 to 2 percent.

Brenton soils are similar to Millbrook soils and are commonly near Drummer and Proctor soils. Millbrook soils have a dark surface layer that is thinner than that of the Brenton soils. Drummer soils have a subsoil that is grayer than that of the Brenton soils. They are in depressions. Proctor soils are not mottled in the upper part of the subsoil. They are in the slightly higher positions on the landscape.

Typical pedon of Brenton silt loam, 0 to 2 percent slopes, in a cultivated field; 1,580 feet south and 320 feet west of the northeast corner of sec. 4, T. 20 N., R. 5 W.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; clear smooth boundary.

Bt1—12 to 21 inches; brown (10YR 5/3) silty clay loam; common fine faint grayish brown (10YR 5/2) and few fine faint light olive brown (2.5Y 5/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; many fine pores; thin continuous gray (10YR 5/1) and thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—21 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; many fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds and lining pores; slightly acid; clear wavy boundary.

Bt3—28 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds and lining pores; slightly acid; clear smooth boundary.

2Bt4—34 to 44 inches; yellowish brown (10YR 5/6) clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; common fine pores; thin discontinuous grayish brown (10YR 5/2) and gray (10YR 5/1) clay films on faces of peds; about 2 percent gravel; slightly acid; clear smooth boundary.

2Bt5—44 to 52 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear smooth boundary.

2BC—52 to 58 inches; yellowish brown (10YR 5/4) silt loam; common medium faint grayish brown (10YR 5/2) mottles; massive; firm; moderately alkaline; clear wavy boundary.

2C—58 to 65 inches; yellowish brown (10YR 5/4) silt loam that has thin strata of loamy fine sand; common medium faint grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The silty material is 25 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is medium acid to neutral. The 2Bt horizon has colors similar to those of the Bt horizon. It is clay loam, silt loam, loam, or sandy loam. It is slightly acid or neutral. The 2C horizon is silt loam, loam, or sandy loam and has thin strata of loamy sand, sand, or loamy fine sand. It is neutral to moderately alkaline and has carbonates in most pedons.

Brenton Variant

The Brenton Variant consists of deep, somewhat poorly drained soils on outwash plains. These soils formed in silty material and in the underlying loamy and sandy outwash. Permeability is moderate in the subsoil and very rapid in the underlying material. Slopes range from 0 to 2 percent.

Brenton Variant soils are similar to Millbrook Variant and Waynetown soils and are commonly near Bowes Variant soils and Mahalasville soils that have a gravelly substratum. Millbrook Variant and Bowes Variant soils have a dark surface layer that is thinner than that of the Brenton Variant soils. Bowes Variant soils are on the slightly higher rises. Waynetown soils have a surface layer that is lighter colored than that of the Brenton Variant soils. Mahalasville soils are in depressions. Their surface layer is darker and more clayey than that of the Brenton Variant soils.

Typical pedon of Brenton Variant silt loam, 0 to 2 percent slopes, in a cultivated field; 1,450 feet east and 2,010 feet south of the northwest corner of sec. 5, T. 20 N., R. 5 W.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Bt1—11 to 17 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; gradual smooth boundary.

Bt2—17 to 24 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; many fine roots; common fine pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; gradual smooth boundary.

Bt3—24 to 32 inches; gray (10YR 5/1) silty clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin discontinuous very dark gray (10YR 3/1) clay films lining root channels and pores; common black (10YR 2/1) iron and manganese oxide accumulations; medium acid; clear smooth boundary.

Bt4—32 to 40 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; many fine pores; thin discontinuous gray (10YR 5/1) clay films in pores; few very dark gray (10YR 3/1) iron and manganese oxide accumulations; neutral; clear smooth boundary.

2Bt5—40 to 47 inches; yellowish brown (10YR 5/4) silt loam; many medium faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous gray (10YR 5/1) clay films on faces of peds; about 3 percent fine gravel; neutral; gradual smooth boundary.

2Btg—47 to 59 inches; gray (N 5/0) gravelly fine sandy loam; common medium prominent olive brown (2.5Y 4/4) mottles; weak coarse subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films bridging sand grains; about 15 percent fine gravel; mildly alkaline; clear wavy boundary.

2Cg—59 to 65 inches; gray (N 5/0) gravelly loamy coarse sand; single grain; loose; about 35 percent gravel; violent effervescence; moderately alkaline.

The solum is 50 to 80 inches thick. The silty material is 2 to 4 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is silt loam or silty clay loam.

The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 6 or less. It is loam, silt loam, clay loam, sandy loam, or the gravelly analogs of these textures. The content of gravel in this horizon ranges from 0 to 20 percent. The 2Btg horizon, if it occurs, has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2, or it is neutral in hue and has chroma of 4 or 5. It is gravelly fine sandy loam, gravelly loam, or gravelly sandy clay loam. It is neutral or mildly alkaline.

The 2Cg horizon ranges from gravelly coarse sand to gravelly loamy sand. The content of material finer textured than very fine sand ranges from 5 to 20 percent in this horizon.

Camden Series

The Camden series consists of deep, well drained, moderately permeable soils on moraines, outwash plains, and till plains. These soils formed in silty material and in the underlying loamy glaciofluvial deposits. Slopes range from 0 to 12 percent.

These soils have a lower base saturation than is definitive for the Camden series, are more acid throughout the solum, and have a thicker solum. These differences, however, do not alter the usefulness or behavior of the soils.

Camden soils are commonly near Starks soils and the Martinsville and Ockley soils that have a till substratum. Martinsville and Ockley soils have less silt and more sand in the upper part of the subsoil than the Camden soils. They are in positions on the landscape similar to those of the Camden soils. Starks soils have a mottled subsoil. They are on the lower rises.

Typical pedon of Camden silt loam, 2 to 6 percent slopes, in a cultivated field; 660 feet south and 1,060 feet west of the northeast corner of sec. 6, T. 18 N., R. 5 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; medium acid; clear smooth boundary.

Bt1—10 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; many fine roots; many fine pores; thin continuous brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—24 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate coarse and medium subangular blocky structure; firm; many fine roots; many fine pores; thin continuous brown (7.5YR 4/4) clay films on faces of peds; extremely acid; clear smooth boundary.

2Bt3—32 to 39 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; many fine roots; many fine pores; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; about 2 percent fine gravel; extremely acid; gradual smooth boundary.

2Bt4—39 to 58 inches; brown (7.5YR 4/4) fine sandy loam; moderate coarse subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; about 5 percent fine gravel; very strongly acid; gradual smooth boundary.

2Bt5—58 to 67 inches; brown (7.5YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; about 2 percent fine gravel; very strongly acid; clear wavy boundary.

2Bt6—67 to 74 inches; strong brown (7.5YR 4/6) fine sandy loam; weak coarse subangular blocky structure; friable; thin discontinuous brown (7.5YR 4/4) clay films bridging sand grains; strongly acid; clear smooth boundary.

3C—74 to 80 inches; yellowish brown (10YR 5/4) sandy loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 50 to 80 inches thick. The silty material is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The Bt and 2Bt horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The Bt horizon is silty clay loam or silt loam. The 2Bt horizon is clay loam, loam, sandy clay loam, sandy loam, or fine sandy loam. The content of gravel in the lower part of this horizon ranges from 0 to 10 percent. The 3C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam or sandy loam.

Casco Series

The Casco series consists of well drained soils on terrace breaks. These soils formed in loamy outwash over sandy and gravelly outwash. They are shallow over sand and gravelly coarse sand. Permeability is moderate in the subsoil and very rapid in the underlying material. Slopes range from 18 to 35 percent.

Casco soils are similar to Boyer and Rodman soils and are commonly near Ockley and Rush soils. Boyer and Rodman soils have less clay in the subsoil than the Casco soils. Ockley and Rush soils have a solum that is thicker than that of the Casco soils. They are in the less sloping areas.

Typical pedon of Casco loam, 18 to 35 percent slopes, in a wooded area; 790 feet west and 530 feet south of the northeast corner of sec. 21, T. 19 N., R. 4 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; about 10 percent gravel; neutral; clear wavy boundary.

Bt1—4 to 12 inches; dark brown (7.5YR 4/4) gravelly clay loam; moderate fine subangular blocky structure; firm; common fine roots; common thin dark reddish brown (5YR 3/2) clay films on faces of peds; about 20 percent gravel; neutral; gradual wavy boundary.

Bt2—12 to 18 inches; brown (7.5YR 5/4) gravelly loam; weak medium subangular blocky structure; firm; few fine roots; few thin dark reddish gray (5YR 4/2) clay films; about 25 percent gravel; neutral; clear wavy boundary.

C—18 to 60 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; few fine roots in the upper part; about 35 percent gravel; strong effervescence; moderately alkaline.

The solum is 12 to 20 inches thick. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. It is loam or sandy loam. The Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 or 5, and chroma of 4. It is clay loam, loam, or the gravelly analogs of these textures. It is slightly acid or neutral.

Ceresco Series

The Ceresco series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in loamy and sandy alluvium. Permeability is moderate or moderately rapid in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 2 percent.

Ceresco soils are similar to Shoals soils and are commonly near Cohoctah and Stonelick soils. Shoals soils have a surface layer that is lighter colored than that of the Ceresco soils. Cohoctah soils have a subsoil that is grayer than that of the Ceresco soils. They are in swales and oxbows. Stonelick soils do not have mottles in the subsoil. They are on the higher flood plains.

Typical pedon of Ceresco loam, occasionally flooded, in a cultivated field; 1,450 feet east and 2,370 feet south of the northwest corner of sec. 14, T. 19 W., R. 4 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—9 to 19 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; few fine faint brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; few roots; common fine pores; neutral; gradual smooth boundary.

Bw1—19 to 27 inches; brown (10YR 4/3) loam; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; few roots; common pores; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw2—27 to 35 inches; yellowish brown (10YR 5/4) sandy loam; common medium faint grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) organic stains on faces of peds; neutral; clear smooth boundary.

Bw3—35 to 40 inches; yellowish brown (10YR 5/4) loamy fine sand; common fine faint grayish brown (10YR 5/2) mottles; single grain; very friable; neutral; gradual smooth boundary.

Bw4—40 to 44 inches; dark yellowish brown (10YR 4/4) sandy loam; few medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 10 percent gravel; neutral; abrupt smooth boundary.

C—44 to 60 inches; pale brown (10YR 6/3) gravelly coarse sand; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum is 30 to 60 inches thick. The depth to gravelly coarse sand ranges from 40 to more than 60 inches.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3. It is loam or sandy loam. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam, sandy loam, fine sandy loam, or loamy fine sand. The content of gravel in this horizon ranges from 0 to 10 percent. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. It is moderately alkaline to neutral.

Chagrin Series

The Chagrin series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in silty and loamy alluvial deposits. Slopes range from 0 to 2 percent.

Chagrin soils are commonly near Lobdell and Stonelick soils. Lobdell soils have grayish mottles in the subsoil. They are in swales. Stonelick soils have carbonates within a depth of 40 inches. They have more sand and less silt in the subsoil than the Chagrin soils. They are on the lower flood plains.

Typical pedon of Chagrin silt loam, rarely flooded, in a cultivated field; 900 feet east and 750 feet north of the southwest corner of sec. 34, T. 17 N., R. 4 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

Bw1—9 to 24 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

Bw2—24 to 40 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; thin discontinuous brown (7.5YR 4/4) organic coatings on faces of peds; slightly acid; gradual smooth boundary.

BC—40 to 48 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; neutral; gradual smooth boundary.

C—48 to 60 inches; yellowish brown (10YR 5/4) sandy loam; massive; strong effervescence; moderately alkaline.

The solum is 35 to 48 inches thick. It is medium acid to neutral. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. It is silt loam, loam, or fine sandy loam. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam, loam, or clay loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam or sandy loam. It ranges from slightly acid to moderately alkaline.

Cohoctah Series

The Cohoctah series consists of deep, very poorly drained, moderately rapidly permeable soils on flood plains. These soils formed in loamy alluvial deposits. Slopes range from 0 to 2 percent.

Cohoctah soils are similar to Saranac soils and are commonly near Beckville and Stonelick soils. Saranac soils have more clay in the control section than the Cohoctah soils. Beckville and Stonelick soils have a subsoil that is browner than that of the Cohoctah soils. They are on the higher rises on flood plains.

Typical pedon of Cohoctah loam, frequently flooded, in a cultivated field; 1,520 feet west and 1,720 feet north of the southeast corner of sec. 30, T. 20 N., R. 3 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; neutral; abrupt smooth boundary.

A1—9 to 16 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; few fine roots; few fine pores; about 2 percent fine gravel; neutral; clear smooth boundary.

A2—16 to 21 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; many medium prominent olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; common fine pores; thin discontinuous very dark gray (10YR 3/1) organic coatings on faces of peds; mildly alkaline; gradual wavy boundary.

Bg1—21 to 36 inches; dark gray (10YR 4/1) fine sandy loam; common fine prominent yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; common fine and medium pores; slight effervescence; mildly alkaline; gradual smooth boundary.

Bg2—36 to 50 inches; gray (10YR 5/1) fine sandy loam; common medium prominent dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; slight effervescence; mildly alkaline; gradual smooth boundary.

Cg—50 to 60 inches; gray (10YR 5/1) stratified loam and sandy loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loam or fine sandy loam. The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is loam, fine sandy loam, silty clay loam, or silt loam. The Cg horizon is loam, sandy loam, or fine sandy loam that has thin strata of sand or loamy sand.

Crosby Series

The Crosby series consists of deep, somewhat poorly drained soils on till plains. These soils formed in silty material and in the underlying loamy glacial drift. Permeability is slow in the subsoil and moderately slow or slow in the underlying material. Slopes range from 0 to 6 percent.

These soils have less clay in the subsoil than is definitive for the Crosby series. This difference, however, does not alter the usefulness or behavior of the soils.

Crosby soils are similar to Fincastle and Reesville soils and are commonly near Miami and Treaty soils. Fincastle and Reesville soils have a solum that is thicker than that of the Crosby soils. Miami soils are well drained and are on the more sloping knobs and breaks. Their subsoil is brownish and has no mottles. Treaty soils have a surface layer that is darker and thicker than that of the Crosby soils. They are in depressions.

Typical pedon of Crosby silt loam, 0 to 2 percent slopes, in a cultivated field; 1,300 feet west and 220 feet south of the northeast corner of sec. 35, T. 20 N., R. 5 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very pale brown (10YR 7/3) dry; weak fine granular structure; friable; many pockets of yellowish brown (10YR 5/6) silt loam; strongly acid; abrupt wavy boundary.

Bt1—9 to 14 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds and lining root channels; very strongly acid; clear smooth boundary.

2Bt2—14 to 22 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm;

few fine roots; few fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds and lining root channels; about 3 percent gravel; very strongly acid; clear smooth boundary.

2Bt3—22 to 33 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine pores; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and lining pores; about 3 percent gravel; strongly acid; clear smooth boundary.

2Bt4—33 to 37 inches; yellowish brown (10YR 5/6) loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 5 percent gravel; slight effervescence; moderately alkaline; clear smooth boundary.

2C—37 to 60 inches; yellowish brown (10YR 5/6) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; about 2 percent gravel; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick. The silty material is 0 to 18 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is loam or silt loam. The Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It ranges from very strongly acid to neutral. The 2Bt horizon has colors similar to those of the Bt horizon. It ranges from very strongly acid to slightly acid. The 2C horizon has hue of 10YR, value of 5, and chroma of 2 to 6.

Cyclone Series

The Cyclone series consists of deep, poorly drained, moderately permeable soils in depressions on till plains. These soils formed in silty material and in the underlying loamy glacial drift. Slopes range from 0 to 2 percent.

The increase in clay content from the surface soil to the subsoil of these soils is less than is definitive for the Cyclone series. This difference, however, does not alter the usefulness or behavior of the soils.

Cyclone soils are similar to Drummer soils and are commonly near Crosby, Fincastle, Milford, and Starks soils. Drummer soils are stratified in the lower part of the solum. Crosby, Fincastle, and Starks soils have a surface layer that is lighter colored than that of the Cyclone soils. Also, they have a browner subsoil. They are on slight rises. Milford soils are more clayey in the subsoil than the Cyclone soils. They are in potholes.

Typical pedon of Cyclone silty clay loam, in a cultivated field; 740 feet east and 2,300 feet north of the southwest corner of sec. 14, T. 20 N., R. 3 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—9 to 13 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure parting to moderate fine granular; firm; many fine roots; few fine pores; slightly acid; clear smooth boundary.

Btg1—13 to 20 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; many fine roots; many medium and fine pores; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; slightly acid; clear wavy boundary.

Btg2—20 to 26 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; many medium and fine pores; several krotovinas filled with very dark gray (10YR 3/1) silty clay loam; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; slightly acid; gradual wavy boundary.

Btg3—26 to 39 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; common fine pores; thin discontinuous very dark grayish brown (10YR 3/2) clay films lining pores; several krotoninas filled with very dark gray (10YR 3/1) silty clay loam; neutral; gradual wavy boundary.

Bt1—39 to 48 inches; yellowish brown (10YR 5/4) silt loam; many medium faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous very dark gray (10YR 3/1) clay films on faces of peds; neutral; gradual wavy boundary.

2Bt2—48 to 61 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) loam; weak coarse subangular blocky structure; firm; few fine pores; thin discontinuous dark gray (10YR 4/1) clay films lining pores; about 5 percent gravel; neutral; gradual wavy boundary.

2C—61 to 70 inches; yellowish brown (10YR 5/4) fine sandy loam; common medium faint grayish brown (10YR 5/2) mottles; massive; firm; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 50 to 70 inches thick. The silty material is 40 to 60 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silt loam. The Btg horizon has hue of 10YR or 2.5Y and value of 3 to 5. It has chroma of 1 to 3 in the upper part and chroma of 1 to 4 in the lower part. The 2Bt and 2C horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The 2Bt horizon is slightly acid or neutral. It is loam or clay loam. The 2C horizon is loam or fine sandy loam.

Drummer Series

The Drummer series consists of deep, poorly drained, moderately permeable soils in depressions on till plains. These soils formed in silty material and in the underlying silty and loamy glaciofluvial deposits. Slopes range from 0 to 2 percent.

Drummer soils are similar to Cyclone soils and are commonly near Brenton and Raub soils. Cyclone soils are not stratified in the lower part of the solum. Brenton and Raub soils are on slight rises. Their subsoil is browner than that of the Drummer soils.

Typical pedon of Drummer silty clay loam, in a cultivated field; 1,150 feet east and 700 feet south of the northwest corner of sec. 7, T. 20 N., R. 4 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; firm; neutral; abrupt smooth boundary.

A—10 to 15 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; firm; many fine roots; neutral; gradual smooth boundary.

Bg1—15 to 26 inches; gray (10YR 5/1) silty clay loam; few medium prominent olive brown (2.5Y 4/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; few fine pores; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear smooth boundary.

Bg2—26 to 37 inches; gray (10YR 5/1) silty clay loam; few fine prominent olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine pores; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; few clean sand grains; neutral; clear smooth boundary.

Bg3—37 to 49 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; few fine pores; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; neutral; gradual smooth boundary.

2Bw—49 to 57 inches; yellowish brown (10YR 5/6) loam; few medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; mildly alkaline; clear smooth boundary.

2C—57 to 65 inches; yellowish brown (10YR 5/6) stratified silt loam and loam; many medium distinct grayish brown (10YR 5/2) mottles; massive; firm; slight effervescence; mildly alkaline.

The solum is 46 to 65 inches thick. The silty material is 40 to 60 inches thick.

The Ap and Bg horizons are slightly acid or neutral. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bg horizon has hue of 10YR and value of 4 or 5. It has chroma of 1 or 2 in the upper part and chroma of 1 to 4 in the lower part. The 2Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is stratified silt loam, sandy loam, or loam.

Fincastle Series

The Fincastle series consists of deep, somewhat poorly drained soils on till plains. These soils formed in silty material and in the underlying loamy glacial drift. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 6 percent.

Fincastle soils are similar to Crosby and Reesville soils and are commonly near Cyclone and Miami soils. Crosby soils have a solum that is thinner than that of the Crosby soils. Reesville soils formed entirely in loess. Cyclone soils are in depressions. Their surface layer is darker and thicker than that of the Fincastle soils, and their subsoil is grayer. Miami soils have a brownish subsoil. They are on the higher, more sloping rises.

Typical pedon of Fincastle silt loam, 0 to 2 percent slopes, in a cultivated field; 1,400 feet west and 1,050 feet north of the southeast corner of sec. 16, T. 20 N., R. 3 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

E—9 to 15 inches; grayish brown (10YR 5/2) silt loam; many medium faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin continuous brown (10YR 5/3) silt coatings on faces of peds; few small dark brown (10YR 3/3) iron and manganese oxide accumulations; very strongly acid; clear smooth boundary.

Bt1—15 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse faint grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to weak medium subangular blocky; firm; common fine roots; common fine pores; thin continuous grayish brown (10YR 5/2) clay films and silt coatings on faces of peds; few dark brown (10YR 3/3) iron and manganese oxide accumulations; very strongly acid; gradual smooth boundary.

Bt2—29 to 33 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; common fine and medium pores; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few dark brown (10YR 3/3) iron and manganese oxide accumulations; medium acid; gradual smooth boundary.

2Bt3—33 to 43 inches; yellowish brown (10YR 5/6) loam; common fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; common fine pores; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; neutral; gradual wavy boundary.

2Bt4—43 to 56 inches; yellowish brown (10YR 5/4) loam; common medium faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) clay films on faces of peds; mildly alkaline; gradual wavy boundary.

2C—56 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty material is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. It is medium acid to very strongly acid. The 2Bt horizon has colors similar to those of the Bt horizon. It is clay loam or loam. It ranges from strongly acid to neutral.

Hennepin Series

The Hennepin series consists of deep, well drained soils in areas of breaks on till plains. These soils formed in loamy glacial drift. Permeability is moderate or moderately slow in the upper part of the profile and slow or moderately slow in the lower part. Slopes range from 18 to 90 percent.

Hennepin soils are commonly near Birkbeck, Miami, and Russell soils. The nearby soils are in the less sloping areas. They have a solum that is thicker than that of the Hennepin soils. Also, Birkbeck and Russell soils have more silt and less sand in the upper part of the solum.

Typical pedon of Hennepin silt loam, 18 to 50 percent slopes, in a wooded area; 1,320 feet west and 920 feet south of the northeast corner of sec. 35, T. 17 N., R. 6 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; neutral; gradual smooth boundary.

Bw1—3 to 8 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; firm; many fine and medium roots; common medium pores; thin discontinuous dark yellowish brown (10YR 3/4) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—8 to 17 inches; yellowish brown (10YR 5/4) loam; weak medium granular structure; firm; many fine and common roots; thin discontinuous dark yellowish brown (10YR 3/4) organic coatings on faces of peds; about 5 percent gravel; neutral; abrupt smooth boundary.

C—17 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; about 8 percent gravel; strong effervescence; moderately alkaline.

The solum is 10 to 20 inches thick. It is loam, sandy loam, or silt loam. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 4. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is neutral or mildly alkaline. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or sandy loam.

Jasper Series

The Jasper series consists of deep, well drained soils on moraines and till plains. These soils formed in silty and loamy sediments. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 2 to 6 percent.

Jasper soils are similar to Proctor soils and are commonly near Brenton soils. Proctor soils have more silt and less sand in the upper part of the subsoil than the Jasper soils. Brenton soils have a mottled subsoil. They are on the slightly lower rises.

Typical pedon of Jasper silt loam, till substratum, 2 to 6 percent slopes, in a cultivated field; 2,100 feet north and 650 feet east of the southwest corner of sec. 10, T. 20 N., R. 6 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; strongly acid; abrupt smooth boundary.

Bt1—10 to 13 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and very fine subangular blocky structure; firm; many fine roots; many fine pores; thin continuous dark brown (10YR 3/3) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; strongly acid; clear smooth boundary.

2Bt2—13 to 21 inches; brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; many fine roots; many fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

2Bt3—21 to 30 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; many fine roots; many fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; strongly acid; gradual wavy boundary.

2Bt4—30 to 44 inches; strong brown (7.5YR 4/6) sandy loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous brown (7.5YR 4/4) and thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; strongly acid; gradual irregular boundary.

2Bt5—44 to 58 inches; brown (7.5YR 4/4) loam; weak coarse subangular blocky structure parting to moderate medium subangular blocky; few fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; medium acid; clear smooth boundary.

3C—58 to 65 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; firm; about 10 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty material is 10 to 20 inches thick.

The Ap horizon has hue of 10YR and chroma and value of 2 or 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. It is medium acid or strongly acid. The 2Bt horizon has hue of 7.5YR and value and chroma of 4 to 6. It ranges from neutral to strongly acid. It is clay loam, sandy clay loam, loam, or fine sandy loam. The content of gravel in this horizon ranges from 0 to 15 percent. The 2C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is loam or fine sandy loam.

Landes Variant

The Landes Variant consists of deep, well drained soils on flood plains. These soils formed in loamy and sandy alluvium. Permeability is moderately rapid in the subsoil and rapid in the underlying material. Slopes range from 0 to 2 percent.

Landes Variant soils are similar to Ormas soils and are commonly near Beckville and Ceresco soils. Ormas soils have a surface layer that is lighter colored than that of the Landes Variant soils. Beckville and Ceresco soils have a mottled subsoil that has more clay than the subsoil of the Landes Variant soils. They are in the lower positions on the landscape.

Typical pedon of Landes Variant fine sandy loam, rarely flooded, in a cultivated field; 2,500 feet west and 2,240 feet south of the northeast corner of sec. 14, T. 19 N., R. 4 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sandy loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; medium acid; abrupt smooth boundary.

A—8 to 13 inches; very dark gray (10YR 3/1) fine sandy loam, grayish brown (10YR 5/2) dry; weak coarse granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

Bw1—13 to 20 inches; dark yellowish brown (10YR 3/4) loamy fine sand; weak medium and coarse subangular blocky structure parting to weak medium granular; friable; few fine roots; neutral; clear smooth boundary.

Bw2—20 to 30 inches; brown (10YR 4/3) loamy fine sand; weak medium and coarse subangular blocky structure parting to weak medium granular; friable; few fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

BC—30 to 42 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine granular structure; friable; strong effervescence; moderately alkaline; clear smooth boundary.

C—42 to 60 inches; light yellowish brown (10YR 6/4) sand; loose; strong effervescence; moderately alkaline.

The solum is 30 to 50 inches thick. The depth to carbonates is 20 to 30 inches.

The Ap horizon has hue of 10YR, value of 3, and chroma of 1 or 2. It is loam, loamy sand, loamy fine sand, or fine sandy loam. The Bw horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is loamy sand or loamy fine sand. It is slightly acid to mildly alkaline. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is sand, loamy sand, or loamy fine sand. It is mildly alkaline or moderately alkaline.

Lobdell Series

The Lobdell series consists of deep, moderately well drained soils on flood plains. These soils formed in loamy and silty alluvial deposits. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Lobdell soils are similar to Beckville soils and are commonly near Chagrin and Stonelick soils. Beckville soils have more sand and less clay in the subsoil than the Lobdell soils. Chagrin soils do not have a mottled subsoil. They are on the slightly higher flood plains. Stonelick soils are less acid than the Lobdell soils. They are on the lower flood plains.

Typical pedon of Lobdell silt loam, rarely flooded, in a cultivated field; 390 feet west and 1,560 feet south of the northeast corner of sec. 34, T. 17 N., R. 4 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; clear wavy boundary.

AB—10 to 16 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; neutral; clear wavy boundary.

Bw1—16 to 26 inches; brown (10YR 4/3) silt loam; common medium faint grayish brown (10YR 5/2) and common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; friable; few roots; few pores; thin discontinuous dark grayish brown (10YR 4/2) coatings on faces of peds; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; neutral; clear wavy boundary.

Bw2—26 to 38 inches; yellowish brown (10YR 5/4) silt loam; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; medium acid; clear wavy boundary.

BC—38 to 50 inches; yellowish brown (10YR 5/6) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; thin discontinuous dark grayish brown (10YR 4/2) coatings; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; medium acid; abrupt wavy boundary.

C—50 to 60 inches; dark grayish brown (10YR 4/2) sandy loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; slightly acid.

The solum is 30 to 50 inches thick. It is medium acid to neutral. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. It is silt loam or loam. The Bw horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is loam, silt loam, or fine sandy loam. The C horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is dominantly loam or sandy loam, but in a few pedons it has gravelly layers below a depth of 40 inches.

Mahalasville Series

The Mahalasville series consists of deep, very poorly drained soils in sluiceways on till plains. These soils formed in silty material and in the underlying stratified, silty and loamy glaciofluvial deposits. Permeability is moderate in the subsoil and moderately rapid in the underlying material. Slopes range from 0 to 2 percent.

Mahalasville soils are similar to Treaty soils and are commonly near Crosby and Starks soils. Treaty soils are not stratified in the lower part of the solum. Crosby and Starks soils are on slight rises. Their surface layer is lighter colored than that of the Mahalasville soils, and their subsoil is browner.

Typical pedon of Mahalasville silty clay loam, in a cultivated field; 2,380 feet east and 400 feet north of the southwest corner of sec. 9, T. 19 N., R. 4 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; firm; slightly acid; abrupt smooth boundary.

A—10 to 15 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; few medium distinct olive brown (2.5Y 4/4) mottles; moderate fine subangular blocky structure; firm; few clean sand grains on faces of peds; slightly acid; clear smooth boundary.

Btg1—15 to 22 inches; gray (10YR 5/1) silty clay loam; many medium prominent olive brown (2.5Y 4/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; common fine roots; many fine pores; thin discontinuous very dark gray (10YR 3/1) clay films and organic coatings on faces of peds and lining pores; common clean fine sand grains; neutral; gradual wavy boundary.

Btg2—22 to 33 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; common fine roots; many fine pores; thin continuous dark gray (10YR 4/1) clay films and organic coatings on faces of peds; neutral; clear wavy boundary.

2Btg3—33 to 40 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few thin dark gray (10YR 4/1) clay films on faces of peds; many sand grains; few black (10YR 2/1) manganese and iron oxide stains on faces of peds; neutral; abrupt smooth boundary.

2Btg4—40 to 52 inches; grayish brown (10YR 5/2) loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 3 percent fine gravel; neutral; clear smooth boundary.

2Cg—52 to 60 inches; gray (10YR 5/1) and yellowish brown (10YR 5/6) stratified sandy loam and loam; a few thin layers of silt loam and gravelly sand; massive; friable; strong effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The silty material is 24 to 40 inches thick.

The Ap and Btg horizons are silty clay loam or silt loam. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Btg horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 1 or 2. It is slightly acid or neutral. The 2Btg horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 1 or 2. It is neutral or mildly alkaline. It is silt loam, loam, or clay loam. The content of gravel in the lower part of this horizon ranges from 0 to 10 percent. The 2Cg horizon is commonly stratified sand to silt loam.

Martinsville Series

The Martinsville series consists of deep, well drained, moderately permeable soils on moraines and till plains. These soils formed in loamy glaciofluvial deposits or in a thin layer of silty material and in the underlying loamy glaciofluvial deposits. Slopes range from 2 to 18 percent.

Martinsville soils are commonly near Fincastle, Mahalasville, and Starks soils and the Ockley soils that have a till substratum. Fincastle and Starks soils have a mottled subsoil and contain less sand in the subsoil than the Martinsville soils. They are on the lower, less sloping rises. Mahalasville soils are in depressions. Their surface layer is thicker and darker than that of the Martinsville soils, and their subsoil is grayish. Ockley soils have more gravel in the solum than the Martinsville soils.

Typical pedon of Martinsville silt loam, till substratum, in a cultivated area of Martinsville-Ockley silt loams, till substrata, 2 to 6 percent slopes; 2,200 feet east and 2,100 feet north of the southwest corner of sec. 36, T. 20 N., R. 5 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few pieces of more clayey subsoil material; slightly acid; abrupt smooth boundary.

Bt1—10 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous brown (10YR 4/3) silt coatings on faces of peds; slightly acid; clear smooth boundary.

2Bt2—14 to 27 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 5 percent fine gravel; few pockets of sandy clay loam; slightly acid; clear wavy boundary.

2Bt3—27 to 38 inches; brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 8 percent gravel; strongly acid; clear wavy boundary.

2Bt4—38 to 49 inches; dark yellowish brown (10YR 4/4) coarse sandy loam; weak medium subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 5 percent fine gravel; strongly acid; clear wavy boundary.

2BC—49 to 56 inches; strong brown (7.5YR 4/6) loamy coarse sand; weak medium subangular blocky structure; friable; strongly acid; clear wavy boundary.

3C—56 to 65 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; firm; about 5 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 50 to 60 inches thick. The silty material is 0 to 20 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is silt loam or silty clay loam. The 2Bt horizon has colors similar to those of the Bt horizon. It is strongly acid to slightly acid. It is clay loam, sandy clay loam, loam, coarse sandy loam, or sandy loam. The content of gravel in this horizon ranges from 0 to 10 percent. The 3C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is fine sandy loam, sandy loam, or loam.

Miami Series

The Miami series consists of deep, well drained soils on till plains. These soils formed in loamy glacial drift or in a thin layer of silty material and in the underlying loamy glacial drift. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 2 to 25 percent.

Miami soils are similar to Russell soils and are commonly near Crosby and Fincastle soils. Russell soils have a solum that is thicker than that of the Miami soils. Crosby and Fincastle soils have a grayish and brownish, mottled subsoil. They are on the less sloping rises.

Typical pedon of Miami silt loam, in a cultivated area of Fincastle-Miami silt loams, 2 to 6 percent slopes, eroded; 100 feet west and 530 feet south of the center of sec. 31, T. 19 N., R. 3 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; few splotches of dark yellowish brown (10YR 4/6) clay loam from the subsoil; slightly acid; abrupt smooth boundary.

Bt1—9 to 18 inches; dark yellowish brown (10YR 4/6) clay loam; moderate medium subangular blocky structure; firm; many fine roots; few fine pores; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; about 3 percent gravel; medium acid; clear wavy boundary.

Bt2—18 to 30 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; many roots; many pores; thin continuous brown (7.5YR 5/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; about 3 percent gravel; medium acid; gradual smooth boundary.

Bt3—30 to 36 inches; yellowish brown (10YR 5/4) clay loam; weak medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 3/2) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; about 5 percent gravel; neutral; clear smooth boundary.

C—36 to 60 inches; brown (10YR 5/3) loam; massive; very firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The silty material is 0 to 18 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is loam or silt loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 5. It is silty clay loam, loam, clay loam, or loam. It ranges from strongly acid to neutral.

Milford Series

The Milford series consists of deep, very poorly drained, moderately slowly permeable soils on till plains and outwash plains. These soils formed in silty, loamy, and clayey sediments. Slopes range from 0 to 2 percent.

Milford soils are similar to Milford Variant soils and are commonly near Cyclone, Fincastle, and Starks soils. Milford Variant soils have less clay in the subsoil than the Milford soils. Cyclone soils are on the higher parts of the landscape. The lower part of their solum formed in glacial drift. Fincastle and Starks soils have a surface layer that is lighter colored than that of the Milford soils. They are on rises.

Typical pedon of Milford silty clay loam, pothole, in a cultivated field; 2,360 feet east and 130 feet south of the northwest corner of sec. 16, T. 19 N., R. 4 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; firm; slightly acid; abrupt smooth boundary.

A—10 to 15 inches; very dark gray (N 3/0) silty clay, dark gray (N 4/0) dry; weak medium subangular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.

BA—15 to 21 inches; very dark gray (N 3/0) silty clay, dark gray (N 4/0) dry; few fine prominent light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; neutral; clear smooth boundary.

Bg1—21 to 33 inches; dark gray (10YR 4/1) silty clay; common medium distinct pale brown (10YR 6/3) mottles; moderate coarse subangular blocky structure; firm; thin continuous black (10YR 2/1) organic coatings on faces of peds; few fine roots; few fine pores; neutral; gradual smooth boundary.

Bg2—33 to 49 inches; gray (10YR 5/1) silty clay; many medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin continuous black (10YR 2/1) organic coatings on faces of peds; few fine shell fragments; slight effervescence in the shell fragments; neutral; gradual smooth boundary.

Cg—49 to 60 inches; gray (10YR 6/1) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; firm; few fine pores; strong effervescence; mildly alkaline.

This solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 2, and chroma of 1 or 2, or it is neutral in hue and has value of 3. The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is clay loam, silty clay loam, or silty clay. It is neutral or mildly alkaline. The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3. It is dominantly silty clay loam or silt loam. In some pedons, however, it has thin strata of loam or sandy loam. It is mildly alkaline or moderately alkaline.

Milford Variant

The Milford Variant consists of deep, very poorly drained soils on outwash plains and till plains. These soils formed in silty and clayey sediments. Permeability is slow in the upper part of the profile and very slow in the lower part. Slopes range from 0 to 2 percent.

Milford Variant soils are similar to Milford soils and are commonly near Palms soils and the Mahalasville soils that have a gravelly substratum. Milford and Mahalasville soils have a solum that is thicker than that of the Milford Variant soils. Also, the solum of the Milford soils is more clayey. Mahalasville soils are in the slightly higher positions on the landscape. Palms soils formed in organic material over silty material. They are in positions on the landscape similar to those of the Milford Variant soils.

Typical pedon of Milford Variant mucky silty clay, in a cultivated field; 1,520 feet west and 1,810 feet north of the southeast corner of sec. 5, T. 20 N., R. 5 W.

Ap—0 to 11 inches; black (10YR 2/1) mucky silty clay, very dark gray (10YR 3/1) dry; weak coarse subangular blocky structure parting to weak fine granular; friable; many roots; few pores; mildly alkaline; clear smooth boundary.

A—11 to 17 inches; black (10YR 2/1) mucky silty clay, black (10YR 2/1) dry; few fine prominent olive brown (2.5Y 4/4) mottles; weak coarse subangular blocky structure; firm; few roots; mildly alkaline; clear smooth boundary.

Bg—17 to 26 inches; olive gray (5Y 5/2) silty clay; many coarse prominent light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure;

firm; many snail shells; few krotovinas filled with black (10YR 2/1) material; strong effervescence in the shells; moderately alkaline; clear smooth boundary.

C—26 to 60 inches; gray (10YR 6/1) silt loam; common medium and coarse prominent light olive brown (2.5Y 5/6) mottles; massive; friable; many light gray (10YR 7/1) lime accumulations; violent effervescence; moderately alkaline.

The solum is 24 to 35 inches thick. The depth to carbonates ranges from 15 to 30 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It is mucky silty clay or mucky silty clay loam. It is neutral or mildly alkaline. The Bg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2, or it is neutral in hue and has value of 4 or 5. It is silty clay or silty clay loam. It is neutral to moderately alkaline. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2, or it is neutral in hue and has value of 4 or 5.

Millbrook Series

The Millbrook series consists of deep, somewhat poorly drained, moderately permeable soils on till plains. These soils formed in silty material and in the underlying loamy and silty glaciofluvial deposits. Slopes range from 0 to 2 percent.

These soils contain more clay in the subsoil than is definitive for the Millbrook series. This difference, however, does not alter the usefulness or behavior of the soils.

Millbrook soils are similar to Brenton soils and are commonly near Drummer and Proctor soils. Brenton and Drummer soils have a surface layer that is thicker and darker than that of the Millbrook soils. Also, Drummer soils have a subsoil that is grayer. They are in depressions. Proctor soils do not have mottles in the upper part of the subsoil. They are on the higher rises.

Typical pedon of Millbrook silt loam, 0 to 2 percent slopes, in a cultivated field; 1,190 feet west and 400 feet north of the southeast corner of sec. 13, T. 20 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

Bt1—8 to 14 inches; brown (10YR 4/3) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; common fine roots; many fine pores; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; common very dark gray (10YR 3/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

Bt2—14 to 23 inches; grayish brown (10YR 5/2) silty clay; many medium distinct olive brown (2.5Y 4/4) mottles; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; few very dark gray (10YR 3/1) iron and manganese oxide accumulations; medium acid; clear smooth boundary.

Bt3—23 to 30 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous gray (10YR 5/1) clay films on faces of peds; few very dark gray (10YR 3/1) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

2Bt4—30 to 34 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; many fine pores; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and lining pores; few very dark gray (10YR 3/1) iron and manganese oxide accumulations; many sand grains; neutral; gradual smooth boundary.

2Bt5—34 to 40 inches; yellowish brown (10YR 5/6) loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; a layer of gravelly loam at a depth of 38 to 40 inches; neutral; abrupt wavy boundary.

2Bt6—40 to 45 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; few pores; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and lining pores; few very dark gray (10YR 3/1) iron and manganese oxide accumulations; few lenses of very fine sand less than 1 inch thick; slight effervescence; moderately alkaline; clear smooth boundary.

2C—45 to 60 inches; yellowish brown (10YR 5/6) silt loam; common medium prominent gray (10YR 6/1) mottles; massive; friable; few lenses of very fine sand less than 1 inch thick; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty material is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is slightly acid to strongly acid. The 2Bt and 2C horizons have hue of 10YR, value of 5, and chroma of 2 to 6. The 2Bt horizon is clay loam, loam, silt loam, or sandy loam. It ranges from slightly acid to moderately alkaline. The 2C horizon is dominantly silt loam, loam, or sandy loam but has strata of coarser textured material. It is neutral to moderately alkaline.

Millbrook Variant

The Millbrook Variant consists of deep, somewhat poorly drained soils on rises on outwash plains. These soils formed in silty material and in the underlying loamy outwash. Permeability is moderate in the subsoil and rapid in the underlying material. Slopes range from 0 to 2 percent.

Millbrook Variant soils are similar to Brenton Variant and Waynetown soils and are commonly near Bowes Variant soils and the Mahalasville soils that have a gravelly substratum. The surface layer of Brenton Variant soils is thicker than that of the Millbrook Variant soils, and the surface layer of Waynetown soils is lighter colored. Bowes Variant soils have a subsoil that is browner than that of the Millbrook Variant soils. They are on the slightly higher rises. Mahalasville soils are in depressions. Their subsoil is grayer than that of the Millbrook Variant soils, and their surface layer is darker and thicker.

Typical pedon of Millbrook Variant silt loam, 0 to 2 percent slopes, in a cultivated field; 150 feet east and 750 feet north of the southwest corner of sec. 16, T. 20 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; strongly acid; abrupt smooth boundary.

Bt1—9 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure parting to moderate medium granular; firm; many fine roots; many fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; very strongly acid; clear smooth boundary.

Bt2—13 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; firm; common fine roots; many fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—18 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; about 2 percent fine gravel; very strongly acid; gradual wavy boundary.

2Bt4—28 to 40 inches; grayish brown (10YR 5/2) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; about 10 percent gravel; very strongly acid; clear smooth boundary.

3Bt5—40 to 50 inches; gray (10YR 5/1) gravelly sandy clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 15 percent gravel; strongly acid; gradual smooth boundary.

3Bt6—50 to 58 inches; gray (10YR 5/1) gravelly coarse sandy loam; many medium distinct olive brown (2.5Y 4/4) mottles; weak coarse subangular blocky structure; firm; about 15 percent gravel; medium acid; clear smooth boundary.

4C—58 to 65 inches; gray (10YR 5/1) gravelly coarse sand; single grain; loose; few thin layers of very fine sand; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum is 50 to 80 inches thick. The silty material is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR, value of 5, and chroma of 2 to 6. It is clay loam, sandy clay loam, or loam. The content of gravel in this horizon ranges from 0 to 10 percent. The 3Bt horizon has hue of 10YR, value of 5, and chroma of 1 to 3. The content of gravel in this horizon ranges from 15 to 35 percent. The 4C horizon is gravelly coarse sand or gravelly loamy sand. The content of material finer textured than very fine sand ranges from 5 to 20 percent in this horizon.

Muskego Series

The Muskego series consists of deep, very poorly drained soils on till plains. These soils formed in sapric material overlying coprogenous earth. Permeability is moderate or moderately rapid in the organic material and slow in the underlying coprogenous material. Slopes range from 0 to 2 percent.

Muskego soils are similar to Palms and Wallkill soils and are commonly near Milford and Milford Variant soils. Palms soils formed in organic material underlain by mineral material. Wallkill soils formed in alluvium overlying sapric material. Milford and Milford Variant soils have a mineral solum. They are in the slightly higher positions on the landscape.

Typical pedon of Muskego muck, drained, in a cultivated field; 2,100 feet west and 1,320 feet south of the northeast corner of sec. 34, T. 20 N., R. 4 W.

Op—0 to 11 inches; muck, black (N 2/0) broken face and rubbed, very dark gray (10YR 3/1) dry; about 7 percent fiber, 1 percent rubbed; moderate medium granular structure; very friable; many fine roots; about 55 percent mineral material; slightly acid; abrupt smooth boundary.

Oa1—11 to 18 inches; muck, dark reddish brown (5YR 3/2) broken face and rubbed; about 7 percent fiber, 1 percent rubbed; moderate coarse subangular blocky structure; friable; few fine roots; thin discontinuous reddish brown (5YR 4/4) iron oxide stains along root channels and on faces of peds; about 71 percent mineral material; slightly acid; clear smooth boundary.

Oa2—18 to 26 inches; muck, dark reddish brown (5YR 3/2) broken face and rubbed; about 6 percent fiber, 1 percent rubbed; weak very coarse prismatic structure; friable; few fine roots; thin discontinuous reddish brown (5YR 4/4) iron oxide stains along root channels and on faces of peds; about 55 percent mineral material; slightly acid; abrupt smooth boundary.

Cg1—26 to 33 inches; coprogenous earth, very dark grayish brown (2.5Y 3/2) broken face, very dark grayish brown (10YR 3/2) rubbed; about 1 percent fiber, broken face and rubbed; massive; firm; few fine roots; thin discontinuous reddish brown (5YR 4/4) iron oxide stains along root channels; about 85 percent mineral material; neutral; clear smooth boundary.

Cg2—33 to 37 inches; coprogenous earth, very dark gray (5Y 3/1) rubbed; about 1 percent fiber, broken face and rubbed; massive; firm; few fine roots; thin discontinuous reddish brown (5YR 4/4) iron oxide stains; about 85 percent mineral material; neutral; abrupt wavy boundary.

Cg3—37 to 46 inches; coprogenous earth, olive gray (5Y 4/2) broken face and rubbed; massive; firm; few fine roots; many calcium carbonate accumulations; thin discontinuous reddish brown (5YR 4/4) iron oxide stains; about 93 percent mineral material; 2-inch layer of gray (5YR 5/1) fine sand at a depth of about 37 inches; mildly alkaline; gradual smooth boundary.

Cg4—46 to 60 inches; coprogenous earth, olive gray (5Y 4/2) broken face and rubbed; massive; firm; common calcium carbonate accumulations; about 87 percent mineral material; mildly alkaline.

The depth to coprogenous earth ranges from 25 to 40 inches. The surface tier is generally black (10YR 2/1 or N 2/0) but in some pedons is dark reddish brown (5YR 3/2) in the lower part. The organic part of the subsurface tier has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of less than 3. The Cg horizon has hue of 10YR, 2.5YR, or 5Y, value of 2 to 4, and chroma of 1 to 3.

Ockley Series

The Ockley series consists of deep, well drained soils on outwash plains, terraces, moraines, and kames. These soils formed in silty material and in the underlying loamy and gravelly sand outwash. Permeability is moderate in the subsoil and very rapid in the underlying material. Slopes range from 0 to 18 percent.

Ockley soils are similar to Rush soils and are commonly near Rush Variant, Shadeland, Starks, and Waynetown soils. Rush soils have less sand and more silt in the subsoil than the Ockley soils. Rush Variant, Shadeland, Starks, and Waynetown soils have a mottled subsoil. They are on the lower rises.

Typical pedon of Ockley silt loam, 0 to 2 percent slopes, in a cultivated field; 1,600 feet south and 1,100 feet west of the northeast corner of sec. 33, T. 19 N., R. 4 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

Bt1—10 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; neutral; gradual smooth boundary.

2Bt2—20 to 33 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; common fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; strongly acid; clear smooth boundary.

2Bt3—33 to 47 inches; brown (7.5YR 4/4) gravelly sandy clay loam; weak medium and coarse subangular blocky structure; firm; thin discontinuous reddish brown (5YR 5/3) clay films on faces of peds; about 20 percent gravel; strongly acid; clear smooth boundary.

2Bt4—47 to 52 inches; reddish brown (5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; firm; thin discontinuous reddish brown (5YR 5/3) clay films on faces of peds; about 15 percent gravel; slightly acid; clear irregular boundary.

2Bt5—52 to 58 inches; dark reddish brown (5YR 3/2) gravelly coarse sandy loam; weak medium subangular blocky structure; firm; thin discontinuous dark reddish brown (5YR 3/2) clay films on faces of peds; about 20 percent gravel; slightly acid; abrupt irregular boundary.

3C—58 to 65 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum is 42 to 60 inches thick. The silty material is 0 to 20 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or silt loam. The Bt horizon, if it occurs, 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 upper part of the 2Bt horizon has colors similar to those of the Bt horizon. It is loam, clay loam, or sandy clay loam. It ranges from very strongly acid to neutral. The lower part has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 2 to 4. It is sandy loam, coarse sandy loam, sandy clay loam, or the gravelly analogs of these textures. It is medium acid to neutral.

The 3C horizon ranges from very gravelly coarse sand to gravelly sand. A till substratum phase and a bedrock substratum phase are recognized in the county.

Octagon Series

The Octagon series consists of deep, well drained soils on till plains. These soils formed in glacial drift or in a thin layer of loamy material and in the underlying loamy glacial drift. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 12 percent.

Octagon soils are similar to Parr soils and are commonly near Raub and Toronto soils. Parr soils have a surface layer that is thicker than that of the Octagon soils. Raub soils have a surface layer that is thicker and darker than that of the Octagon soils. Raub and Toronto soils have a grayish and brownish, mottled subsoil. They are on nearly level rises.

Typical pedon of Octagon loam, 2 to 6 percent slopes, in a cultivated field; 400 feet south and 790 feet west of the northeast corner of sec. 13, T. 20 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 4/2) loam, grayish brown (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

Bt1—8 to 16 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous dark brown (10YR 3/3) clay films and organic coatings on faces of peds; neutral; gradual wavy boundary.

Bt2—16 to 24 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous dark reddish brown (5YR 3/2) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt3—24 to 30 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; thin discontinuous dark reddish brown (5YR 3/2) clay films on faces of peds; about 8 percent fine gravel; slight effervescence; moderately alkaline; diffuse wavy boundary.

C—30 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; firm; about 10 percent gravel; violent effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 1 to 3. It is silt loam or loam. 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, clay loam, sandy clay loam, or loam. It ranges from medium acid to moderately alkaline. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is loam or fine sandy loam.

Ormas Series

The Ormas series consists of deep, well drained soils on terraces. These soils formed in sandy material and in the underlying loamy outwash over sandy and gravelly outwash. Permeability is moderately rapid in the subsoil and very rapid in the underlying material. Slopes range from 1 to 4 percent.

Ormas soils are similar to Landes Variant soils and are commonly near Boyer and Ockley soils. Landes Variant soils do not have gravel in the subsoil. Their surface layer is thicker and darker than that of the Ormas soils. Boyer and Ockley soils have less sand and more clay in the upper part of the subsoil than the Ormas soils. They are in the slightly higher positions on the landscape.

Typical pedon of Ormas loamy sand, 1 to 4 percent slopes, in a pasture; 1,970 feet east and 1,970 feet south of the northwest corner of sec. 14, T. 19 N., R. 4 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

Bw1—9 to 18 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grain; very friable; many fine roots; few fine pores; few irregularly shaped spots that are slightly higher in clay content; few pores filled with very dark grayish brown (10YR 3/2) material; neutral; gradual smooth boundary.

Bw2—18 to 27 inches; yellowish brown (10YR 5/4) loamy sand; single grain; very friable; many fine roots; about 1 percent fine gravel; neutral; abrupt smooth boundary.

2Bt1—27 to 38 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse subangular blocky structure; firm; few fine roots; many fine pores; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent fine gravel; neutral; clear smooth boundary.

2Bt2—38 to 51 inches; dark brown (7.5YR 4/4) gravelly coarse sandy loam; weak fine and medium subangular blocky structure; firm; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds and coating individual sand grains; about 30 percent gravel; neutral; clear smooth boundary.

2C—51 to 60 inches; very pale brown (10YR 7/3) gravelly coarse sand; single grain; loose; about 50 percent gravel; strong effervescence; mildly alkaline.

The solum is 45 to 80 inches thick. The thickness of the material coarser textured than loamy very fine sand ranges from 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loamy sand or loamy fine sand. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 4. It is loamy sand, loamy fine sand, or sand. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. It is coarse sandy loam, sandy clay loam, or the gravelly analogs of these textures. The content of gravel in this horizon ranges from 2 to 30 percent.

Palms Series

The Palms series consists of deep, very poorly drained soils on flood plains, till plains, and moraines. These soils formed in sapric material overlying silty material. Permeability is moderately slow to moderately rapid in the organic material and moderate or moderately slow in the mineral material. Slopes range from 0 to 2 percent.

Palms soils are similar to Muskego soils and are commonly near Milford, Milford Variant, and Wallkill soils. Muskego soils formed in organic material underlain by coprogenous earth. Milford and Milford Variant soils have a mineral solum. They are in the slightly higher positions on the landscape. Wallkill soils formed in mineral overwash overlying organic material.

Typical pedon of Palms muck, drained, in a cultivated field; 2,430 feet south and 910 feet east of the northwest corner of sec. 34, T. 20 N., R. 4 W.

Op—0 to 10 inches; muck, black (10YR 2/1) broken face and rubbed, very dark gray (10YR 3/1) dry; about 5 percent fiber, a trace rubbed; moderate medium granular structure; very friable; neutral; abrupt smooth boundary.

Oa—10 to 17 inches; muck, black (10YR 2/1) broken face and rubbed; about 5 percent fiber, a trace rubbed; moderate medium granular structure; very friable; many fine roots; a 2-inch layer of dark reddish brown (5YR 3/2) hemic material at a depth of about 15 inches; slightly acid; abrupt wavy boundary.

Cg1—17 to 30 inches; dark grayish brown (2.5Y 4/2) silt loam; few fine faint olive brown (2.5Y 4/4) mottles; gray (10YR 5/1) silt loam in root channels and pores; weak coarse subangular blocky structure; firm; few fine roots; few fine pores; few 1- to 3-inch layers of grayish brown (10YR 5/2) loamy sand that is slightly effervescent; neutral; gradual wavy boundary.

Cg2—30 to 44 inches; grayish brown (2.5Y 5/2) silt loam; many fine faint light olive brown (2.5Y 5/4) mottles; weak medium platy structure; friable; many white (10YR 8/1) calcium carbonate accumulations; few shells; strong effervescence; moderately alkaline; gradual smooth boundary.

Cg3—44 to 60 inches; gray (5Y 5/1) silt loam; massive; friable; few layers of gray (5Y 5/1) fine sand less than 1 inch thick; strong effervescence; moderately alkaline.

The organic deposits are 16 to 35 inches thick. The surface tier is black (10YR 2/1 or N 2/0) or very dark brown (10YR 2/2). The subsurface and bottom tiers have hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2, or they are neutral in hue and have value of 2 or 3. They are slightly acid to mildly alkaline. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is loam, silt loam, clay loam, or sandy loam.

Parr Series

The Parr series consists of deep, well drained soils on till plains. These soils formed in glacial drift or in silty material and in the underlying loamy glacial drift. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 2 to 6 percent.

Parr soils are similar to Octagon soils and are commonly near Raub soils. Octagon soils have a surface layer that is thinner than that of the Parr soils. Raub soils have a mottled subsoil. They are on the less sloping rises.

Typical pedon of Parr silt loam, 2 to 6 percent slopes, in a cultivated field; 1,350 feet south and 1,850 feet west of the northeast corner of sec. 4, T. 20 N., R. 4 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10Y 5/3) dry; weak fine granular structure; friable; strongly acid; clear smooth boundary.

Bt1—11 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium granular structure; firm; many fine roots; many fine pores; thin continuous very dark grayish brown (10YR 3/2) organic coatings and clay films on faces of peds; strongly acid; clear smooth boundary.

2Bt2—17 to 25 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; many fine roots; many fine pores; thin discontinuous brown (10YR 4/3) clay films on faces of peds; about 5 percent gravel; strongly acid; clear smooth boundary.

2Bt3—25 to 34 inches; yellowish brown (10YR 5/6) loam; weak coarse subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

2C—34 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick. The silty material is 0 to 18 inches thick.

The Ap horizon has hue of 10YR and value and chroma of 2 or 3. It is loam or silt loam. The Bt and 2Bt horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. They are loam, clay loam, or silty clay loam. They range from strongly acid to neutral. The 2C horizon is loam, sandy loam, or fine sandy loam.

Pella Series

The Pella series consists of deep, very poorly drained, moderately permeable soils on outwash plains and till plains. These soils formed in silty material. Slopes range from 0 to 2 percent.

Pella soils are similar to Milford soils and are commonly near Palms soils and the Mahalasville soils that have a gravelly substratum. Milford and Mahalasville soils have a solum that is thicker than that of the Pella soils. Also, Milford soils are more clayey in the solum. Mahalasville soils are in the slightly higher positions on the landscape. Palms soils formed in organic material over silty material. They are in positions on the landscape similar to those of the Pella soils.

Typical pedon of Pella silty clay loam, in a cultivated field; 1,400 feet south and 1,100 feet west of the northeast corner of sec. 9, T. 20 N., R. 5 W.

Ap—0 to 11 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; firm; many roots; few pores; mildly alkaline; clear smooth boundary.

Bg1—11 to 14 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct olive brown (2.5Y 4/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few fine roots; mildly alkaline; clear smooth boundary.

Bg2—14 to 34 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few fine roots; few fine pores; thin discontinuous gray (10YR 5/1) coatings on faces of peds; neutral; clear smooth boundary.

2C—34 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common medium light olive brown (2.5Y 5/6) mottles; massive; friable; layers of very fine sand less than 1 inch thick; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. It is silt loam or silty clay loam. The depth to carbonates ranges from 16 to 40 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It is neutral or mildly alkaline. The Bg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2, or it is neutral in hue and has value of 4 or 5. It is neutral to moderately alkaline. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2, or it is neutral in hue and has value of 4 or 5.

Proctor Series

The Proctor series consists of deep, moderately well drained and well drained soils on till plains. These soils formed in silty material and in the underlying loamy glaciofluvial deposits. Permeability is moderate in the subsoil and moderate or moderately rapid in the underlying material. Slopes range from 0 to 6 percent.

Proctor soils are similar to the Jasper soils that have a till substratum. They are commonly near Brenton and Drummer soils. Jasper soils have more sand and less silt in the upper part of the subsoil than the Proctor soils. Brenton soils have grayish mottles directly below the surface layer. They are on the lower rises. Drummer soils have a gray subsoil. They are in depressions.

Typical pedon of Proctor silt loam, moderately wet, 0 to 2 percent slopes, in a cultivated field; 150 feet east and 2,380 feet north of the southwest corner of sec. 6, T. 20 N., R. 4 W.

Ap—0 to 12 inches; black (10YR 2/1) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; strongly acid; clear smooth boundary.

AB—12 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure parting to moderate fine granular; firm; many fine roots; many fine pores; thin continuous dark brown (10YR 3/3) coatings on faces of peds; strongly acid; clear smooth boundary.

Bt1—17 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; many fine roots; many fine pores; thin continuous brown (10YR 4/3) clay films on faces of peds; thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; strongly acid; clear smooth boundary.

Bt2—25 to 39 inches; brown (10YR 5/3) silty clay loam; common medium faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; many fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous black (10YR 2/1) manganese and iron oxide stains on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; few clean sand grains; slightly acid; clear smooth boundary.

2Bt3—39 to 49 inches; yellowish brown (10YR 5/4) sandy clay loam; many medium faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; common fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous black (10YR 2/1) manganese and iron oxide stains on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; about 3 percent gravel; neutral; clear smooth boundary.

2BC—49 to 58 inches; yellowish brown (10YR 5/4) silt loam; many medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few black (10YR 2/1) iron and manganese oxide accumulations; slight effervescence; mildly alkaline; clear smooth boundary.

2C—58 to 65 inches; yellowish brown (10YR 5/4) loam; many fine faint grayish brown (10YR 5/2) mottles; massive; firm; strata of yellowish brown (10YR 5/4) loamy sand; strong effervescence; mildly alkaline.

The solum is 40 to 70 inches thick. The silty material is 20 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The Bt horizon has hue of 10YR, value of 3 to 5, and chroma of 3 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is clay loam or loam. The 2BC horizon is loam, sandy loam, or silt loam. The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam, loam, sandy loam, or loamy sand. It is neutral to moderately alkaline.

Ragsdale Series

The Ragsdale series consists of deep, very poorly drained, moderately permeable soils on till plains. These soils formed in loess. Slopes range from 0 to 2 percent.

The increase in clay content from the surface soil to the subsoil of these soils is less than is definitive for the Ragsdale series. This difference, however, does not alter the usefulness or behavior of the soils.

Ragsdale soils are similar to Washtenaw soils and are commonly near Fincastle and Reesville soils. Washtenaw soils formed in alluvium overlying a buried soil. Fincastle and Reesville soils have a surface layer that is lighter colored than that of the Ragsdale soils. They are on slight rises.

Typical pedon of Ragsdale silty clay loam, in a cultivated field; 1,060 feet east and 500 feet north of the southwest corner of sec. 4, T. 17 N., R. 5 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many roots; neutral; clear smooth boundary.

A—10 to 13 inches; very dark gray (10YR 3/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; few fine distinct olive brown (2.5Y 4/4) mottles; weak coarse subangular blocky structure; firm; few roots; few pores; neutral; gradual smooth boundary.

Btg1—13 to 23 inches; gray (10YR 5/1) silty clay loam; many medium olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; few roots; common pores; thin discontinuous gray (10YR 5/1) clay films on faces of peds; neutral; gradual smooth boundary.

Btg2—23 to 27 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; common pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; gradual smooth boundary.

Btg3—27 to 37 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; common pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; gradual smooth boundary.

Btg4—37 to 50 inches; light brownish gray (10YR 6/2) silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common roots; common pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; mildly alkaline; clear smooth boundary.

Cg—50 to 60 inches; yellowish brown (10YR 5/6) silt loam; many coarse prominent light brownish gray (10Y 6/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 48 to 60 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Btg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 6. It is dominantly silty clay loam but is silt loam in a few pedons. The Cg horizon is mildly alkaline or moderately alkaline.

Raub Series

The Raub series consists of deep, somewhat poorly drained, moderately slowly permeable soils on rises on till plains. These soils formed in silty material and in the underlying loamy glacial drift. Slopes range from 0 to 2 percent.

Raub soils are similar to Toronto soils and are commonly near Proctor and Drummer soils. Toronto soils have a dark surface layer that is thinner than that of the Raub soils. Proctor soils do not have mottles directly below the surface layer. They are on the higher rises. Drummer soils are more clayey in the surface layer than the Raub soils. They are in depressions.

Typical pedon of Raub silt loam, 0 to 2 percent slopes, in a cultivated field; 350 feet south and 300 feet west of the northeast corner of sec. 8, T. 20 N., R. 3 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

A—10 to 13 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; medium acid; clear smooth boundary.

Bt1—13 to 18 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous very dark grayish brown (10YR 3/2) clay films and organic coatings on faces of peds; strongly acid; clear smooth boundary.

Bt2—18 to 32 inches; dark yellowish brown (10YR 4/6) silty clay loam; few fine prominent grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine pores; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—32 to 37 inches; yellowish brown (10YR 5/6) silty clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine pores; thin discontinuous gray (10YR 5/1) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt4—37 to 50 inches; yellowish brown (10YR 5/6) loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; about 3 percent gravel; thin discontinuous gray (10YR 5/1) clay films on faces of peds; neutral; clear smooth boundary.

2Bt5—50 to 60 inches; dark yellowish brown (10YR 4/6) loam; common fine prominent light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; about 3 percent gravel; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear smooth boundary.

2C—60 to 70 inches; yellowish brown (10YR 5/4) loam; few fine faint grayish brown (10YR 5/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty material is 22 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is strongly acid to slightly acid. The 2Bt horizon has colors similar to those of the Bt horizon. It is clay loam or loam.

Reesville Series

The Reesville series consists of deep, somewhat poorly drained soils on till plains and outwash plains. These soils formed in loess. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Reesville soils are similar to Crosby and Fincastle soils and are commonly near Birkbeck, Ragsdale, and Xenia soils. Crosby and Fincastle soils have more sand in the lower part of the solum than the Reesville soils. Birkbeck and Xenia soils do not have mottles in the upper part of the subsoil. They are on rises and breaks. Ragsdale soils are in depressions. Their surface layer is thicker and darker than that of the Reesville soils, and their subsoil is grayer.

Typical pedon of Reesville silt loam, 0 to 2 percent slopes, in a cultivated field; 2,380 feet west and 2,440 feet north of the southeast corner of sec. 27, T. 19 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; common very dark gray (10YR 3/1) iron and manganese oxide accumulations; medium acid; abrupt smooth boundary.

E—8 to 9 inches; light brownish gray (10YR 6/2) silt loam, light gray (10YR 7/2) dry; few medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure parting to moderate medium granular; friable; common fine roots; common very dark gray (10YR 3/1) iron and manganese oxide accumulations; strongly acid; abrupt irregular boundary.

Bt1—9 to 14 inches; grayish brown (10YR 5/2) silty clay loam; many medium prominent dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; common fine pores; thin continuous grayish brown (10YR 5/2) clay films and thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few very dark gray (10YR 3/1) iron and manganese oxide accumulations and stains; very strongly acid; clear smooth boundary.

Bt2—14 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; thin continuous gray (10YR 5/1) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; common dark grayish brown (10YR 4/2) fillings in root channels; few very dark gray (10YR 3/1) iron and manganese oxide accumulations and stains; medium acid; clear smooth boundary.

Bt3—22 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few fine roots; few fine pores; thin continuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on the faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; common very dark gray (10YR 3/1) iron and manganese oxide accumulations; slightly acid; gradual smooth boundary.

Bt4—34 to 45 inches; light olive brown (2.5Y 5/4) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on faces of peds; few very dark gray (10YR 3/1) iron and manganese oxide stains; mildly alkaline; gradual smooth boundary.

C1—45 to 55 inches; light olive brown (2.5Y 5/4) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; massive; friable; few calcium carbonate nodules; slight effervescence; moderately alkaline; gradual smooth boundary.

C2—55 to 60 inches; light olive brown (2.5Y 5/4) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; massive; friable; few calcium carbonate nodules; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The loess is more than 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. The C horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 to 4.

Rodman Series

The Rodman series consists of excessively drained, very rapidly permeable soils on terrace breaks. These soils are shallow over sand and gravel. They formed in gravelly and sandy outwash. Slopes range from 35 to 70 percent.

Rodman soils are similar to Boyer and Casco soils and are commonly near Ockley and Rush soils. Boyer and Casco soils have more clay and less sand and gravel in the subsoil than the Rodman soils. Ockley and Rush soils have a solum that is thicker than that of the Rodman soils. They are on the less sloping terraces.

Typical pedon of Rodman gravelly loam, in a wooded area of Rodman-Rock outcrop complex, 35 to 70 percent slopes; 1,700 feet south and 2,000 feet west of the northeast corner of sec. 21, T. 19 N., R. 4 W.

A—0 to 5 inches; very dark gray (10YR 3/1) gravelly loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; about 20 percent fine gravel; neutral; clear wavy boundary.

Bw—5 to 10 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; weak fine granular structure; very friable; common fine roots; about 30 percent fine gravel; neutral; clear wavy boundary.

C—10 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; about 50 percent gravel; strong effervescence; moderately alkaline.

The solum is 8 to 15 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is gravelly loam or gravelly sandy loam. The Bw horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4. It is gravelly loam, gravelly sandy loam, or gravelly coarse sand.

Rush Series

The Rush series consists of deep, well drained, moderately permeable soils on terraces and outwash plains. These soils formed in silty material and in loamy outwash over gravelly sand. Slopes range from 0 to 6 percent.

Rush soils are similar to Ockley soils and are commonly near Rush Variant and Waynetown soils. Ockley soils have more sand and less silt in the upper part of the subsoil than the Rush soils. Rush Variant and Waynetown soils have gray mottles in the subsoil. They are on the lower rises.

Typical pedon of Rush silt loam, 0 to 1 percent slopes, in a cultivated field; 2,500 feet east and 1,850 feet south of the northwest corner of sec. 22, T. 19 N., R. 4 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

Bt1—10 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; firm; common fine roots; common fine pores; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—15 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; common fine roots; common fine pores; thin continuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—24 to 34 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin continuous yellowish red (5YR 4/6) clay films on faces of peds;

few clean sand grains; very strongly acid; clear wavy boundary.

2Bt4—34 to 46 inches; brown (7.5YR 4/4) clay loam; moderate medium and coarse subangular blocky structure; firm; few fine pores; thin discontinuous dark reddish brown (5YR 3/3) clay films on faces of peds; about 3 percent gravel; very strongly acid; abrupt wavy boundary.

2Bt5—46 to 53 inches; dark brown (7.5YR 4/4) gravelly loam; weak coarse subangular blocky structure; firm; thin discontinuous dark reddish brown (5YR 3/2) clay films on faces of peds; about 30 percent gravel; neutral; clear wavy boundary.

2BC—53 to 62 inches; dark brown (7.5YR 4/4) gravelly sandy loam; massive; friable; about 35 percent gravel; mildly alkaline; clear wavy boundary.

2C—62 to 70 inches; brown (10YR 5/3) gravelly sand; single grain; loose; about 35 percent gravel; strong effervescence; moderately alkaline.

The solum is 60 to 70 inches thick. The silty material is 24 to 45 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. It is loam, clay loam, sandy clay loam, or the gravelly analogs of these textures. Gravelly sandy loam or gravelly coarse sandy loam is below a depth of 40 inches in some pedons. The 2C horizon is coarse sand, sand, or the gravelly or very gravelly analogs of these textures.

Rush Variant

The Rush Variant consists of deep, moderately well drained soils on outwash plains and terraces. These soils formed in silty material and loamy outwash over gravelly and sandy outwash. Permeability is moderate in the subsoil and rapid in the underlying material. Slopes range from 0 to 2 percent.

Rush Variant soils are similar to Bowes Variant soils and are commonly near Rush and Waynetown soils. Bowes Variant soils have a surface layer that is darker than that of the Rush Variant soils. Rush soils do not have mottles in the subsoil. They are on the higher rises. Waynetown soils have a subsoil that is grayer than that of the Rush Variant soils. They are on the lower rises.

Typical pedon of Rush Variant silt loam, 0 to 2 percent slopes, in a cultivated field; 920 feet north and 390 feet west of the southeast corner of sec. 18, T. 19 N., R. 4 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; slightly acid; clear wavy boundary.

Bt1—9 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—13 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt3—18 to 22 inches; brown (7.5YR 4/4) silty clay loam; few medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt4—22 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; thin discontinuous yellowish red (5YR 5/6) iron oxide stains on faces of peds; medium acid; clear wavy boundary.

2Bt5—28 to 40 inches; yellowish brown (10YR 5/4) clay loam; common medium faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure parting to weak medium subangular blocky; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; about 10 percent gravel; medium acid; clear smooth boundary.

2Bt6—40 to 52 inches; grayish brown (10YR 5/2) gravelly sandy clay loam; many medium prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure parting to weak medium subangular blocky; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 15 percent gravel; slightly acid; gradual wavy boundary.

2Bt7—52 to 59 inches; dark grayish brown (10YR 4/2) gravelly sandy clay loam; few medium prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; common very dark grayish brown (10YR 3/2) clay films on faces of peds; about 15 percent gravel; slightly acid; clear wavy boundary.

2C—59 to 65 inches; brown (10YR 5/3) gravelly loamy sand; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum is 50 to 80 inches thick. The silty material is 20 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It is clay loam, sandy clay loam, loam, or the gravelly analogs of these textures. The 2C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It ranges from gravelly coarse sand to gravelly loamy sand. The content of material finer textured than very fine sand ranges from 5 to 20 percent in this horizon.

Russell Series

The Russell series consists of deep, well drained, moderately permeable soils on till plains and moraines. These soils formed in loess and in the underlying loamy glacial till. Slopes range from 6 to 12 percent.

Russell soils are similar to Miami soils and are commonly near Birkbeck, Hennepin, and Xenia soils. Miami and Hennepin soils have a solum that is thinner than that of the Russell soils. Hennepin soils are on the more sloping breaks. Birkbeck and Xenia soils are mottled in the lower part of the solum. They are on the less sloping ridgetops.

Typical pedon of Russell silt loam, 6 to 12 percent slopes, in a wooded area; 790 feet west and 200 feet south of the northeast corner of sec. 10, T. 17 N., R. 6 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many roots; many pores; medium acid; clear smooth boundary.

E—3 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak medium granular structure; friable; many roots; many pores; strongly acid; clear smooth boundary.

Bt1—11 to 15 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; many roots; many pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—15 to 27 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; many roots; many pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; firm; very strongly acid; gradual smooth boundary.

Bt3—27 to 34 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common roots; many pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; firm; very strongly acid; clear smooth boundary.

2Bt4—34 to 44 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; firm; few roots; few pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; firm; very strongly acid; gradual smooth boundary.

2Bt5—44 to 55 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; firm; few roots; few pores; about 10 percent gravel; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; firm; strongly acid; clear smooth boundary.

2Bt6—55 to 63 inches; yellowish brown (10YR 5/4) clay loam; weak coarse subangular blocky structure; thin discontinuous dark yellowish brown (10YR 4/4) clay films; firm; about 5 percent gravel; firm; medium acid; gradual smooth boundary.

2C—63 to 70 inches; brown (10YR 5/3) loam; massive; firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The loess is 20 to 40 inches thick.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Some pedons have an Ap horizon. This horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. It is very strongly acid to medium acid. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam or clay loam. The 2C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Saranac Series

The Saranac series consists of deep, very poorly drained soils on flood plains. These soils formed in silty and loamy alluvial deposits. Permeability is moderately slow in the subsoil and moderately rapid in the underlying material. Slopes range from 0 to 2 percent.

Saranac soils are commonly near Ceresco and Cohoctah soils. Ceresco soils have a subsoil that is browner than that of the Saranac soils. They are on the slightly higher flood plains. Cohoctah soils have more sand and less clay in the subsoil than the Saranac soils. They are on the slightly lower flood plains.

Typical pedon of Saranac silty clay loam, gravelly substratum, frequently flooded, in a cultivated field; 150 feet west and 920 feet south of the northeast corner of sec. 22, T. 20 N., R. 3 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; firm; mildly alkaline; abrupt smooth boundary.

A—9 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; common medium distinct olive brown (2.5Y 4/4) mottles; weak fine subangular blocky structure; firm; about 3 percent fine gravel; mildly alkaline; clear smooth boundary.

Bg1—14 to 20 inches; dark gray (10YR 4/1) silty clay loam; many medium prominent light olive brown

(2.5Y 5/4) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; thin discontinuous very dark gray (10YR 3/1) organic coatings on faces of peds; about 2 percent fine gravel; neutral; gradual smooth boundary.

Bg2—20 to 38 inches; gray (10YR 5/1) silty clay loam; many medium prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; thin discontinuous very dark gray (10YR 3/1) organic coatings on faces of peds; few krotovinas filled with very dark gray (10YR 3/1) silty clay; about 2 percent fine gravel; neutral; gradual wavy boundary.

Cg1—38 to 49 inches; gray (10YR 5/1) silty clay loam; many medium prominent olive yellow (2.5Y 6/8) mottles; massive; firm; few krotovinas filled with very dark gray (10YR 3/1) silty clay; about 2 percent fine gravel; neutral; clear smooth boundary.

Cg2—49 to 60 inches; gray (10YR 5/1) gravelly coarse sandy loam; single grain; loose; about 35 percent gravel; strong effervescence; mildly alkaline.

The solum is 45 to 60 inches thick. It is neutral or mildly alkaline. The Ap horizon has hue of 10YR, value of 2 or 3, chroma of 1 or 2. It is dominantly silty clay loam, but the range includes silt loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam or clay loam. The C horizon is gravelly loam, gravelly sandy loam, gravelly sand, or gravelly loamy sand.

Shadeland Series

The Shadeland series consists of moderately deep, somewhat poorly drained, moderately slowly permeable soils on bedrock terraces. These soils formed in loamy outwash and in the underlying silty material weathered from interbedded siltstone and sandstone. Slopes range from 1 to 4 percent.

Shadeland soils are commonly near the Ockley soils that have a bedrock substratum. The nearby soils are not mottled. They are on the slightly higher rises.

Typical pedon of Shadeland silt loam, 1 to 4 percent slopes, in a cultivated field; 1,250 feet west and 2,110 feet north of the southeast corner of sec. 20, T. 19 N., R. 4 W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

Bt1—11 to 16 inches; dark yellowish brown (10YR 4/6) loam; many medium prominent grayish brown (10YR 5/2) mottles; weak coarse and medium subangular blocky structure; firm; few roots; few pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds and lining pores; neutral; clear smooth boundary.

Bt2—16 to 26 inches; grayish brown (10YR 5/2) clay loam; many coarse prominent dark yellowish brown (10YR 4/6) mottles; weak coarse and medium subangular blocky structure; firm; few roots; few pores; thin continuous grayish brown (10YR 5/2) and thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and lining pores; about 10 percent gravel; neutral; clear smooth boundary.

2Bt3—26 to 35 inches; yellowish brown (10YR 5/8) silty clay loam; many medium prominent grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few roots; common pores; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and lining pores; about 10 percent shale fragments; neutral; gradual smooth boundary.

2R—35 inches; partly weathered siltstone that grades to unweathered siltstone at a depth of about 40 inches; mildly alkaline.

The solum is 30 to 40 inches thick. The outwash is 15 to 35 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 8. It is loam, clay loam, or sandy loam. The content of gravel in this horizon ranges from 0 to 15 percent. The 2Bt horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 4 to 8. It is silt loam or silty clay loam. The 2R horizon is siltstone or siltstone interbedded with sandstone.

Shoals Series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in loamy and silty alluvium. Slopes range from 0 to 2 percent.

Shoals soils are similar to Ceresco soils and are commonly near Beckville and Washtenaw soils. Ceresco soils have a surface layer that is thicker and darker than that of the Shoals soils. Beckville soils have more sand in the subsoil than the Shoals soils. They are in the slightly higher positions on the landscape. Washtenaw soils have a buried soil. They are on till plains.

Typical pedon of Shoals silt loam, occasionally flooded, in a pasture; 530 feet south and 100 feet east of the northwest corner of sec. 25, T. 17 N., R. 6 W.

A—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; few roots; mildly alkaline; clear wavy boundary.

Cg1—8 to 20 inches; dark grayish brown (2.5Y 4/2) silt loam; many fine faint dark gray (10YR 4/1) and common fine distinct olive brown (2.5Y 4/4) mottles;

weak fine granular structure; friable; few roots; neutral; diffuse smooth boundary.

Cg2—20 to 33 inches; dark grayish brown (2.5Y 4/2) silt loam that has noticeable sand; many fine faint dark gray (10YR 4/1) and common fine faint olive brown (2.5Y 4/4) mottles; weak fine granular structure; friable; few roots; neutral; diffuse smooth boundary.

Cg3—33 to 46 inches; gray (2.5Y 5/2) silt loam; common medium faint olive gray (5Y 5/2) and common medium distinct olive brown (2.5Y 4/4) mottles; massive; friable; thin strata of loam; common dark reddish brown (5YR 3/3) iron and manganese oxide accumulations; slight effervescence; mildly alkaline; clear wavy boundary.

Cg4—46 to 60 inches; gray (10YR 5/1) loam; common medium distinct dark grayish brown (2.5Y 4/2) mottles; massive; friable; strata of silt loam, sandy loam, and sand; slight effervescence; moderately alkaline.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is silt loam or loam. It is neutral or mildly alkaline. The Cg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silt loam or loam in the upper part and loam or sandy loam in the lower part.

Starks Series

The Starks series consists of deep, somewhat poorly drained, moderately permeable soils on till plains. These soils formed in silty material and in the underlying loamy and silty glaciofluvial deposits. Slopes range from 0 to 2 percent.

Starks soils are similar to Whitaker soils and are commonly near Crosby and Mahalasville soils and the Martinsville and Ockley soils that have a till substratum. Whitaker soils have less silt and more sand in the upper part of the subsoil than the Starks soils. Crosby soils are not stratified in the lower part of the solum. Mahalasville soils are in depressions. Their surface layer is darker and thicker than that of the Starks soils, and their subsoil is grayer. Martinsville and Ockley soils do not have mottles in the subsoil. They are on the higher rises.

Typical pedon of Starks silt loam, in a cultivated area of Starks-Crosby silt loams, 0 to 2 percent slopes; 1,850 feet west and 530 feet south of the northeast corner of sec. 23, T. 18 N., R. 3 W.

Ap—0 to 11 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; clear smooth boundary.

Bt1—11 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct dark yellowish brown (10YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; firm; few fine roots; common fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous brown (10YR 5/3) silt coatings on faces of peds; discontinuous very dark gray (10YR 3/1) iron and manganese oxide stains on faces of peds; slightly acid; clear smooth boundary.

Bt2—21 to 36 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) and common medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; firm; common fine roots; common fine pores; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin discontinuous brown (10YR 5/3) silt coatings on faces of peds; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; medium acid; clear smooth boundary.

2Bt3—36 to 49 inches; dark yellowish brown (10YR 3/4) clay loam; common medium distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

2C1—49 to 55 inches; yellowish brown (10YR 5/4) silt loam; many medium faint grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; moderately alkaline; clear smooth boundary.

2C2—55 to 60 inches; brown (10YR 5/3) silt loam; many fine faint grayish brown (10YR 5/2) mottles; massive; firm; strata of very fine sand less than 1 inch thick; strong effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The silty material is 25 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 5, and chroma of 2 to 6. It is silt loam or silty clay loam. It is slightly acid to strongly acid. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is sandy loam, silt loam, silty clay loam, clay loam, or loam. It is medium acid to neutral. The 2C horizon is dominantly silt loam, loam, or sandy loam, but it has thin layers of very fine sand, loamy sand, or sand in most pedons. It is neutral to moderately alkaline.

St. Charles Series

The St. Charles series consists of deep, well drained, moderately permeable soils on moraines. These soils formed in silty material and in the underlying loamy glaciofluvial deposits. Slopes range from 2 to 6 percent.

St. Charles soils are similar to Alford soils and are commonly near Camden and Reesville soils. Alford soils formed entirely in silty material. Camden soils have a mantle of silty material that is thinner than that of the St. Charles soils. They are in landscape positions similar to those of the St. Charles soils. Reesville soils have grayish mottles in the upper part of the subsoil. They are in the less sloping areas.

Typical pedon of St. Charles silt loam, 2 to 6 percent slopes, in a cultivated field; 2,360 feet east and 1,580 feet north of the southwest corner of sec. 29, T. 18 N., R. 5 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; friable; many roots; medium acid; abrupt smooth boundary.

Bt1—9 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; many fine roots; many fine pores; thin continuous brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—17 to 24 inches; strong brown (7.5YR 5/6) silty clay loam; moderate coarse subangular blocky structure; firm; many fine roots; many fine pores; thin continuous dark reddish brown (5YR 3/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—24 to 33 inches; brown (7.5YR 4/4) silty clay loam; moderate coarse subangular blocky structure; firm; common fine roots; many fine pores; common thin dark reddish brown (5YR 3/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt4—33 to 44 inches; strong brown (7.5YR 4/6) silt loam; moderate coarse subangular blocky structure; firm; few fine roots; many fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt5—44 to 49 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse subangular blocky structure; friable; common pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; few pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

2Bt6—49 to 56 inches; brown (7.5YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; common pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 3 percent gravel; strongly acid; gradual wavy boundary.

2Bt7—56 to 63 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; friable; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; strongly acid; gradual wavy boundary.

2C—63 to 70 inches; strong brown (7.5YR 4/6) fine sandy loam; massive; friable; about 5 percent gravel; strong effervescence; mildly alkaline.

The solum is 50 to 80 inches thick. The silty material is 40 to 60 inches thick. The content of gravel ranges from 0 to 10 percent in the 2Bt and 2C horizons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is medium acid to very strongly acid. The 2Bt horizon is loam or fine sandy loam. It ranges from very strongly acid to neutral. The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It ranges from silt loam to sandy loam. It is neutral or mildly alkaline.

Stonelick Series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils on flood plains. These soils formed in loamy and silty alluvium. Slopes range from 0 to 2 percent.

Stonelick soils are similar to Stonelick Variant soils and are commonly near Landes Variant and Beckville soils. Stonelick Variant soils have less clay in the subsoil than the Stonelick soils. Beckville soils have a mottled subsoil. They are on the lower flood plains. Landes Variant soils have a surface layer that is darker than that of the Stonelick soils. They are on the higher flood plains.

Typical pedon of Stonelick silt loam, occasionally flooded, in a cultivated field; 2,400 feet east and 750 feet north of the southwest corner of sec. 16, T. 18 N., R. 5 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 17 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; common fine pores; slight effervescence; mildly alkaline; gradual smooth boundary.

C1—17 to 33 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; few fine roots; common fine pores; thin continuous dark brown (10YR 3/3) organic coatings on faces of peds; few strata of sand in the lower part; slight effervescence; mildly alkaline; clear smooth boundary.

C2—33 to 43 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse subangular blocky structure parting to weak fine granular; friable; slight effervescence; mildly alkaline; clear smooth boundary.

C3—43 to 60 inches; brown (10YR 4/3) fine sandy loam; massive; friable; strong effervescence; moderately alkaline.

The solum is 10 to 40 inches thick. The control section is mildly alkaline or moderately alkaline.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is loam or silt loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly loam, silt loam, or fine sandy loam, but it has strata of loamy sand or sand in some pedons. It is mildly alkaline or moderately alkaline.

Stonelick Variant

The Stonelick Variant consists of deep, well drained soils on flood plains. These soils formed in loamy and sandy alluvium. Permeability is moderately rapid in the upper part of the underlying material and very rapid in the lower part. Slopes range from 0 to 2 percent.

Stonelick Variant soils are similar to Stonelick soils and are commonly near Beckville soils. Stonelick soils have more clay and less sand in the control section than the Stonelick Variant soils. Beckville soils have mottles in the lower part of the subsoil. They are on the slightly higher flood plains.

Typical pedon of Stonelick Variant fine sandy loam, frequently flooded, in a wooded area; 1,810 feet west and 930 feet south of the northeast corner of sec. 21, T. 19 N., R. 4 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; slight effervescence; mildly alkaline; gradual smooth boundary.

A2—5 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common pores; slight effervescence; moderately alkaline; clear smooth boundary.

C1—9 to 19 inches; dark yellowish brown (10YR 3/4) loamy fine sand; weak fine granular structure; very friable; few roots; few pores; slight effervescence; moderately alkaline; gradual smooth boundary.

C2—19 to 32 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grain; very friable; few roots; few pores; strong effervescence; moderately alkaline; gradual smooth boundary.

C3—32 to 41 inches; brown (10YR 4/3) loamy sand; single grain; loose; about 5 percent fine gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

C4—41 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; about 35 percent gravel; strong effervescence; moderately alkaline.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is loam, fine sandy loam, or loamy sand. The C horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is sand, loamy sand, loamy fine sand, or gravelly coarse sand.

Toronto Series

The Toronto series consists of deep, somewhat poorly drained soils on till plains. These soils formed in silty material and in the underlying loamy glacial drift. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

These soils contain more clay in the subsoil than is definitive for the Toronto series. This difference, however, does not alter the usefulness or behavior of the soils.

Toronto soils are similar to Raub soils and are commonly near Millbrook and Drummer soils. Raub soils have a dark surface layer that is thicker than that of the Toronto soils. Millbrook soils are stratified in the lower part of the solum. They are in positions on the landscape similar to those of the Toronto soils. Drummer soils are in depressions. Their surface layer is thicker than that of the Toronto soils, and their subsoil is grayer.

Typical pedon of Toronto silt loam, 0 to 2 percent slopes, in a cultivated field; 1,980 feet east and 1,580 feet north of the southwest corner of sec. 3, T. 20 N., R. 3 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

Bt1—9 to 13 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—13 to 20 inches; yellowish brown (10YR 5/4) silty clay; many medium faint grayish brown (10YR 5/2) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; thin continuous gray (10YR 5/1) and dark gray (10YR 4/1) clay films and silt coatings on faces of peds and lining pores; strongly acid; gradual smooth boundary.

Bt3—20 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; thin continuous gray (10YR 5/1) and dark gray (10YR 4/1) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt4—28 to 37 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous dark gray (10YR 4/1) and gray

(10YR 5/1) clay films on faces of peds; medium acid; gradual wavy boundary.

2Bt5—37 to 48 inches; yellowish brown (10YR 5/6) loam; common medium prominent light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; about 2 percent fine gravel; neutral; gradual wavy boundary.

2Bt6—48 to 54 inches; yellowish brown (10YR 5/6) loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 2 percent fine gravel; a 3-inch layer of silt loam at a depth of about 51 inches; slight effervescence; mildly alkaline; gradual wavy boundary.

2C—54 to 60 inches; yellowish brown (10YR 5/4) loam; common medium faint grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 42 to 60 inches thick. The silty material is 22 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It ranges from 6 to slightly less than 10 inches in thickness. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It ranges from strongly acid to neutral. The 2Bt horizon has colors similar to those of the Bt horizon. It ranges from strongly acid to mildly alkaline. The 2C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Treaty Series

The Treaty series consists of deep, very poorly drained soils in depressions on till plains. These soils formed in silty material and in the underlying loamy glacial drift. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 0 to 2 percent.

Treaty soils are similar to Mahalasville soils and are commonly near Crosby, Fincastle, and Starks soils. Mahalasville soils are stratified in the lower part of the solum. Crosby, Fincastle, and Starks soils are on slight rises. Their surface layer is lighter colored than that of the Treaty soils, and their subsoil is browner.

Typical pedon of Treaty silty clay loam, in a cultivated field; 660 feet east and 1,580 feet north of the southwest corner of sec. 35, T. 20 N., R. 5 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—10 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; firm; slightly acid; clear smooth boundary.

Btg1—14 to 22 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine faint light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous olive gray (5Y 5/2) clay films on faces of peds and lining pores; thin continuous very dark gray (10YR 3/1) organic stains on faces of peds; neutral; clear wavy boundary.

Btg2—22 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine faint light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine pores; thin discontinuous olive gray (2.5Y 5/2) clay films on faces of peds and lining pores; few black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

2Btg3—36 to 59 inches; gray (10YR 5/1) loam; common medium prominent dark yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; about 5 percent gravel; mildly alkaline; gradual wavy boundary.

2Cg—59 to 70 inches; yellowish brown (10YR 5/4) loam; common medium distinct gray (10YR 5/1) mottles; massive; firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 41 to 65 inches thick. The silty material is 24 to 40 inches thick.

The Ap and Btg horizons are neutral or slightly acid. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silt loam. The Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. The 2Btg horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is clay loam or loam. It is neutral or mildly alkaline.

Wallkill Series

The Wallkill series consists of deep, very poorly drained soils on moraines and till plains. These soils formed in loamy alluvium overlying sapric material. Permeability is moderate in the mineral material and moderately rapid in the organic material. Slopes range from 0 to 2 percent.

These soils contain more silt and less sand in the control section than is definitive for the Wallkill series. This difference, however, does not alter the usefulness or behavior of the soils.

Wallkill soils are similar to Muskego and Palms soils and are commonly near Milford soils. Muskego soils formed in organic material overlying coprogenous earth. Palms soils formed in organic material overlying mineral material. Milford soils are in positions on the landscape similar to those of the Wallkill soils. They have a mineral solum. Their surface layer is darker and more clayey than that of the Wallkill soils.

Typical pedon of Wallkill silt loam, in a cultivated field; 130 feet west and 790 feet south of the northeast corner of sec. 1, T. 18 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; common medium faint olive brown (2.5Y 4/4) mottles; weak medium platy structure parting to moderate medium granular; friable; neutral; abrupt smooth boundary.

Cg1—8 to 15 inches; dark grayish brown (10YR 4/2) silt loam; few fine distinct olive brown (2.5Y 4/4) mottles; massive; friable; few fine roots; few fine pores; thin discontinuous olive brown (2.5Y 4/4) iron oxide stains lining root channels; many thin strata of light yellowish brown (2.5Y 6/4) silt loam; neutral; gradual smooth boundary.

Cg2—15 to 20 inches; olive gray (5Y 5/2) silt loam; common medium distinct olive brown (2.5Y 4/4) mottles; massive; firm; few fine pores; thin discontinuous olive brown (2.5Y 4/4) iron oxide stains lining root channels; few pockets of black (10YR 2/1) sapric material; neutral; clear smooth boundary.

Oa1—20 to 30 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 10 percent fiber when broken, 5 percent rubbed; weak coarse subangular blocky structure; friable; few pockets of olive gray (5YR 5/2) silt loam; neutral; gradual smooth boundary.

Oa2—30 to 60 inches; sapric material, dark reddish brown (5YR 3/2) broken face and rubbed; about 40 percent fiber when broken, 10 percent rubbed; weak medium platy structure; friable; neutral.

The mineral material is 16 to 40 inches thick. The Ap horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. The Cg horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. It is silt loam or silty clay loam. The Oa horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly sapric material but has some hemic material.

Washtenaw Series

The Washtenaw series consists of deep, poorly drained soils on till plains and moraines. These soils formed in alluvium overlying a buried soil, which formed in loess or in loess and loamy material. Permeability is moderate in the upper part of the profile and slow in the lower part. Slopes range from 0 to 2 percent.

These soils contain more silt and less sand in the control section than is definitive for the Washtenaw series. This difference, however, does not alter the usefulness or behavior of the soils.

Washtenaw soils are similar to Ragsdale soils and are commonly near Reesville soils. Ragsdale and Reesville soils formed entirely in loess. Reesville soils are on rises.

Typical pedon of Washtenaw silt loam, frequently flooded, in a cultivated field; 2,390 feet west and 1,720 feet north of the southeast corner of sec. 27, T. 18 N., R. 6 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/1) dry; weak fine granular structure; friable; many roots; neutral; clear smooth boundary.

C—8 to 25 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct olive brown (2.5Y 4/4) mottles; weak coarse granular structure; friable; common roots; few pores; thin discontinuous brown (7.5YR 4/4) iron oxide stains lining root channels; common very dark gray (10YR 3/1) pieces of organic debris; neutral; clear smooth boundary.

2Ab—25 to 33 inches; very dark gray (10YR 3/1) silty clay loam; moderate coarse subangular blocky structure; firm; few roots; few pores; mildly alkaline; clear smooth boundary.

2Btgb1—33 to 42 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; moderate coarse subangular blocky structure; firm; few pores; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; mildly alkaline; gradual smooth boundary.

2Btgb2—42 to 54 inches; gray (10YR 5/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; mildly alkaline; gradual smooth boundary.

2Cg—54 to 60 inches; gray (10YR 5/1) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; firm; few white (10YR 8/1) snail shells; strong effervescence in the snail shells; moderately alkaline.

The overwash is 20 to 40 inches thick. The Ap, C, and 2Ab horizons are neutral or mildly alkaline. The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2. The 2Ab horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The 2Btgb horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam, clay loam, loam, or silt loam. The 2Cg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. It is silt loam or loam. It is mildly alkaline or moderately alkaline.

Waupecan Series

The Waupecan series consists of deep, well drained soils on outwash plains. These soils formed in silty material and in loamy outwash over sandy and gravelly outwash. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 2 percent.

Waupecan soils are similar to Wea soils and are commonly near Brenton Variant soils and the Mahalasville soils that have a gravelly substratum. Wea soils have more sand and less silt in the upper part of the subsoil than the Waupecan soils. Brenton Variant soils have a mottled subsoil. They are in the lower positions on the landscape. Mahalasville soils have a grayish subsoil. They are in swales and depressions.

Typical pedon of Waupecan silt loam, 0 to 2 percent slopes, in a cultivated field; 150 feet east and 260 feet north of the southwest corner of sec. 2, T. 20 N., R. 6 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

Bt1—11 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common thin dark brown (10YR 3/3) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt2—16 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin discontinuous brown (7.5YR 4/4) and dark brown (10YR 3/3) clay films on faces of peds; few clean sand grains in the lower part; very strongly acid; gradual smooth boundary.

2Bt3—35 to 48 inches; dark yellowish brown (10YR 4/4) loam; moderate coarse subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/4) and dark brown (10YR 3/3) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Bt4—48 to 61 inches; dark yellowish brown (10YR 4/4) gravelly coarse sandy loam; weak coarse subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds and bridging sand grains; about 18 percent gravel; very strongly acid; gradual smooth boundary.

2Bt5—61 to 67 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; weak coarse subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds and bridging sand grains; about 20 percent gravel; medium acid; clear wavy boundary.

2Bt6—67 to 72 inches; dark reddish brown (5YR 3/3) gravelly sandy clay loam; weak coarse subangular blocky structure; firm; thin discontinuous dusky red (2.5YR 3/2) clay films bridging sand grains; about 25 percent gravel; neutral; abrupt wavy boundary.

2C—72 to 80 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; about 25 percent gravel; strong effervescence; moderately alkaline.

The solum is 50 to 80 inches thick. The silty material is 28 to 55 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4. The 2Bt horizon has hue of 5YR to 10YR and value and chroma of 3 or 4. It is clay loam, loam, sandy clay loam, sandy loam, or the gravelly analogs of these textures. The content of gravel in this horizon ranges from 0 to 25 percent. The 2C horizon ranges from gravelly coarse sand to gravelly loamy coarse sand. The content of material finer textured than very fine sand ranges from 5 to 20 percent in this horizon.

Waynetown Series

The Waynetown series consists of deep, somewhat poorly drained soils on terraces and outwash plains. These soils formed in silty material and in the underlying loamy outwash over sandy and gravelly outwash. Permeability is moderate in the subsoil and rapid in the underlying material. Slopes range from 0 to 2 percent.

Waynetown soils are similar to Brenton Variant and Millbrook Variant soils and are commonly near Rush soils and the Mahalasville soils that have a gravelly substratum. Brenton Variant and Millbrook Variant soils have a surface layer that is darker than that of the Waynetown soils. Mahalasville soils are in depressions. Their surface layer is thicker and darker than that of the Waynetown soils. Rush soils have a brownish subsoil that is not mottled. They are on the higher rises.

Typical pedon of Waynetown silt loam, 0 to 2 percent slopes, in a cultivated field; 920 feet east and 2,376 feet north of the southwest corner of sec. 18, T. 19 N., R. 4 W.

Ap—0 to 10 inches; dark brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

E—10 to 14 inches; grayish brown (10YR 5/2) silt loam; common medium faint dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; common fine roots; common fine pores; thin continuous pale brown (10YR 6/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt—14 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots along faces of prisms; common fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few clean sand grains; medium acid; clear smooth boundary.

Btg1—21 to 32 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin continuous light gray (10YR 6/2) silt coatings on faces of peds; few clean sand grains; medium acid; clear wavy boundary.

2Btg2—32 to 45 inches; grayish brown (10YR 5/2) loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; about 5 percent gravel; medium acid; clear wavy boundary.

3Btg3—45 to 57 inches; gray (10YR 5/1) gravelly sandy clay loam; few medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 16 percent gravel; slightly acid; clear wavy boundary.

3Btg4—57 to 70 inches; dark gray (N 4/0) gravelly sandy clay loam; few medium prominent yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; thin discontinuous very dark gray (N 3/0) clay films on faces of peds; about 17 percent gravel; slight effervescence in the lower 5 inches; neutral; gradual wavy boundary.

3Cg—70 to 75 inches; gray (10YR 5/1) gravelly coarse sand; single grain; loose; about 25 percent gravel; strong effervescence; moderately alkaline.

The solum is 50 to 80 inches thick. The silty material is 20 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt and 2Bt horizons are medium acid or slightly acid, and the 3Bt horizon is slightly acid or neutral. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. It is clay loam, sandy clay loam, or loam. The content of gravel in this horizon ranges from 0 to 5 percent. The 3Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4, or it is neutral in hue and has value of 4 or 5. It is gravelly clay loam, sandy clay loam, or gravelly loam. The content of gravel in this horizon ranges from 15 to 30 percent.

The 3Cg horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is gravelly loamy coarse sand or gravelly coarse sand. The content of material finer textured than very fine sand ranges from 5 to 20 percent in this horizon.

Wea Series

The Wea series consists of deep, well drained soils on kames and outwash plains. These soils formed in silty material and in loamy outwash over sandy and gravelly outwash. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slopes range from 2 to 6 percent.

Wea soils are similar to Waupecan soils and are commonly near Brenton Variant soils. Waupecan soils have more silt and less sand in the upper part of the subsoil than the Wea soils. Brenton Variant soils have a mottled subsoil. They are in the lower positions on the landscape.

Typical pedon of Wea silt loam, 2 to 6 percent slopes, in a cultivated field; 1,060 feet east and 2,380 feet north of the southwest corner of sec. 14, T. 20 N., R. 5 W.

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; noticeable sand; medium acid; clear smooth boundary.

Bt1—10 to 17 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine and medium subangular blocky structure; firm; few roots; common pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—17 to 27 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few roots; common pores; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; about 10 percent gravel; strongly acid; clear smooth boundary.

2Bt3—27 to 36 inches; brown (7.5YR 4/4) gravelly loam; weak medium subangular blocky structure; firm; common pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; about 15 percent gravel; medium acid; clear smooth boundary.

2Bt4—36 to 54 inches; brown (7.5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable; thin discontinuous reddish brown (5YR 4/3) clay films coating sand grains; about 20 percent gravel; neutral; clear smooth boundary.

3C—54 to 60 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; about 25 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The silty material is 0 to 20 inches thick.

The Ap horizon has hue of 10YR and value and chroma of 2 or 3. It is silt loam or loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4. Some pedons have a Bt horizon that formed in silty material. This horizon is silt loam or silty clay loam. It has colors similar to those of the typical Bt horizon. In pedons that do not have silty material, the upper part of the Bt horizon is loam or clay loam. The 2Bt horizon is gravelly clay loam, gravelly loam, or gravelly sandy loam. It is medium acid to neutral. The 3C horizon ranges from gravelly coarse sand to gravelly loamy sand. The content of material finer textured than very fine sand ranges from 5 to 20 percent in this horizon.

Weikert Series

The Weikert series consists of shallow, well drained, moderately rapidly permeable soils in areas of breaks on terraces and till plains along Sugar Creek and its larger tributaries. These soils formed in material weathered from interbedded sandstone, shale, and siltstone. Slopes range from 35 to 80 percent.

These soils have a higher base saturation and are less acid than is definitive for the Weikert series. These differences, however, do not alter the usefulness or behavior of the soils.

Weikert soils are commonly near Birkbeck, Rodman, and Russell soils. Birkbeck and Russell soils are on ridgetops. Their solum has less gravel and is thicker than that of the Weikert soils. Rodman soils formed in gravelly outwash. They are in positions on the landscape similar to those of the Weikert soils.

Typical pedon of Weikert channery loam, in a wooded area of Weikert-Rock outcrop complex, 35 to 80 percent slopes; 2,500 feet west and 660 feet south of the northeast corner of sec. 21, T. 18 N., R. 5 W.

A—0 to 4 inches; black (10YR 2/1) channery loam, very dark grayish brown (10YR 3/2) dry; moderate fine and medium granular structure; friable; many fine roots; common fine pores; about 25 percent partially weathered sandstone and siltstone fragments; mildly alkaline; clear smooth boundary.

Bw1—4 to 12 inches; dark yellowish brown (10YR 3/4) channery loam; weak fine subangular blocky structure parting to moderate fine granular; friable; many roots; common pores; thin discontinuous very dark grayish brown (10YR 3/2) clay films and organic coatings on faces of peds; about 45 percent partially weathered sandstone and siltstone fragments; mildly alkaline; clear smooth boundary.

Bw2—12 to 15 inches; dark yellowish brown (10YR 4/4) channery loam; weak fine subangular blocky structure parting to weak fine and medium granular; friable; common fine roots; common fine pores; about 60 percent partially weathered sandstone and siltstone fragments; mildly alkaline; clear wavy boundary.

R—15 inches; pale brown (10YR 6/3) fractured sandstone bedrock; mildly alkaline.

The solum is 9 to 20 inches thick. It ranges from medium acid to mildly alkaline. The content of shale, siltstone, and sandstone fragments or glacial pebbles ranges from 20 to 80 percent throughout the solum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. It is channery loam, channery silt loam, or flaggy loam. The Bw horizon has hue of 10YR, value of 3 to 5, and chroma of 3 to 6. It is channery loam, channery silt loam, very channery loam, or flaggy loam.

Whitaker Series

The Whitaker series consists of deep, somewhat poorly drained soils on till plains, terraces, and moraines. These soils formed in silty material and in the underlying silty and loamy glaciofluvial deposits. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Starks soils and are commonly near Crosby and Mahalasville soils. Starks soils have less sand and more silt in the upper part of the subsoil than the Whitaker soils. Crosby soils are in positions on the landscape similar to those of the Whitaker soils. Their subsoil has more clay than that of the Whitaker soils. Also, they have compact glacial till within a depth of 40 inches. Mahalasville soils are in depressions. Their surface layer is darker than that of the Whitaker soils, and their subsoil has less sand.

Typical pedon of Whitaker silt loam, till substratum, 0 to 2 percent slopes, in a cultivated field; 1,470 feet east and 990 feet south of the northwest corner of sec. 20, T. 17 N., R. 3 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak coarse granular structure; friable; neutral; clear wavy boundary.

Bt1—10 to 18 inches; dark yellowish brown (10YR 4/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few roots; common pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; neutral; clear smooth boundary.

2Bt2—18 to 30 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; common roots; common pores; thin discontinuous brown (7.5YR 5/2) clay films on faces of peds; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; slightly acid; clear wavy boundary.

2Bt3—30 to 40 inches; yellowish brown (10YR 5/6) sandy clay loam; many medium prominent gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; few pores; thin discontinuous brown

(7.5YR 5/2) clay films on faces of peds; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; neutral; gradual wavy boundary.

2Bt4—40 to 52 inches; yellowish brown (10YR 5/4) sandy clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous brown (7.5YR 5/2) clay films on faces of peds; thin discontinuous black (10YR 2/1) iron and manganese oxide accumulations; few thin strata of sandy loam; mildly alkaline; gradual wavy boundary.

2C—52 to 56 inches; yellowish brown (10YR 5/4) loamy fine sand; single grain; loose; strong effervescence; moderately alkaline; clear smooth boundary.

3C—56 to 60 inches; yellowish brown (10YR 5/4) sandy loam; massive; friable; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 36 to 60 inches thick. The silty material is 0 to 24 inches thick. The depth to till ranges from 40 to more than 60 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam, but the range includes loam and sandy loam. The Bt and 2Bt horizons have hue of 10YR, value of 4 to 6, and chroma of 3 to 6. They are clay loam, sandy clay loam, sandy loam, silty clay loam, silt loam, or loam. The 2C horizon, if it occurs, is sandy loam, fine sandy loam, very fine sandy loam, loamy sand, loamy fine sand, loam, or silt loam. The 3C horizon is sandy loam or loam.

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 in the underlying loamy till. Slopes range from 2 to 10 percent.

Xenia soils are commonly near Birkbeck, Fincastle, Miami, Reesville, and Ragsdale soils. Birkbeck soils formed in 40 to 60 inches of loess and in the underlying till. They are in the higher positions on the landscape. Fincastle and Reesville soils have mottles directly below the surface layer. They are in the lower positions on the landscape. Miami soils are not mottled. They are in positions on the landscape similar to those of the Xenia soils. Ragsdale soils have a dark surface layer. They are in depressions.

Typical pedon of Xenia silt loam, in a cultivated area of Xenia-Birkbeck silt loams, 2 to 6 percent slopes, eroded; 530 feet east and 2,080 feet south of the northwest corner of sec. 4, T. 17 N., R. 5 W.

Ap—0 to 9 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; friable; few splotches of dark yellowish brown (10YR 4/6) silty clay loam from the subsoil; strongly acid; clear smooth boundary.

Bt1—9 to 14 inches; dark yellowish brown (10YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; few roots; few pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous yellowish brown (10YR 5/4) silt coatings on faces of peds; extremely acid; clear smooth boundary.

Bt2—14 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few roots; common pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin discontinuous reddish brown (5YR 4/4) iron oxide stains on faces of peds; thin discontinuous black (10YR 2/1) iron and manganese oxide stains on faces of peds; very strongly acid; clear wavy boundary.

Bt3—20 to 27 inches; dark yellowish brown (10YR 4/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) mottles; moderate coarse and medium subangular blocky structure; firm; common pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin discontinuous reddish brown (5YR 4/4) iron oxide stains on faces of peds; very strongly acid; clear smooth boundary.

2Bt4—27 to 38 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin and medium discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds and in root channels; slightly acid; gradual smooth boundary.

2BC—38 to 45 inches; yellowish brown (10YR 5/4) clay loam; common fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films and thin discontinuous black (10YR 2/1) iron and manganese oxide coatings on faces of peds; neutral; gradual smooth boundary.

2C—45 to 60 inches; yellowish brown (10YR 5/4) loam; common medium faint grayish brown (10YR 5/2) mottles; massive; very firm; strong effervescence; moderately alkaline.

The solum is 36 to 55 inches thick. The loess is 22 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is loam or clay loam.

Formation of the Soils

This section relates the major factors of soil formation to the soils in the 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 accumulated and has 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 the 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 also affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of 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 effect 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 Montgomery County were deposited by glaciers, by melting water from the glaciers, and by wind, which blew loess over the county. After the material was deposited, some of it was reworked and redeposited by the subsequent actions of wind and water. Although the parent materials are of similar glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited.

The soils in Montgomery County formed mainly in Wisconsinan glacial drift, glacial outwash, lacustrine material, loess, or a combination of these. A few soils formed in organic material, and the soils on flood plains formed in alluvium. A few soils formed in material weathered from bedrock.

Glacial drift is material deposited by glaciers. It consists of particles of different sizes that are mixed together. The pebbles in the drift include a wide variety of rocks. They range from sedimentary rocks, such as black shale, to igneous rocks, such as granite. The glacial drift ranges from 0 to 200 feet in thickness (*9*). It is thickest in the southeast corner of the county and in some areas in the valley of Sugar Creek.

The Kansan, Illinoian, and Wisconsinan glaciers covered the county, but the Wisconsinan, the most recent, is the only one that influenced soil formation within a depth of 80 inches. The Kansan glacier, the oldest, and the Illinoian glacier, the next in age, covered the county more than 100,000 years ago. Radioactive carbon dating indicates that the Wisconsinan glacier covered the county about 20,000 to 22,000 years ago. The Crawfordsville moraine, which extends across the county from northwest to southeast, is a useful marker separating the different Wisconsinan glacial formations. The Carterburg till member, which has been carbon dated at about 20,000 years old, is north of the moraine.

The drift north of the moraine contains both lodgement and ablation till. Lodgement till was deposited beneath the ice. Ablation till was derived from debris carried in the ice. It generally is much more friable and permeable than the lodgement till. In most areas it is entirely leached of carbonates, whereas the lodgement till is leached only in the upper few inches. On the ground moraines, a 6-inch to 3-foot layer of ablation till overlies the more compact lodgement till. In some of the depressions, the ablation till is as much as 4 feet thick. On some of the morainal knobs, the lodgement till is difficult to identify and may not occur at all. Layers of coarse grained material are evident to a depth of several feet. The texture of both the ablation till and the lodgement till is sandy loam or loam. Ablation till weathers mainly to loam, sandy loam, or sandy clay loam. Camden soils formed in silty material and in the underlying ablation till.

The pebbles in lodgement till generally have sharp corners, indicating that they have not been rounded by water. The pebbles in the ablation till are both rounded and unrounded, indicating that they have been washed by water to a considerable extent.

The Center Grove till member, which is south of the Crawfordsville moraine, has been carbon dated at about 21,000 years old (*10*). This member is dominantly lodgement till. It does not have the layer of ablation till characteristic of the till north of the moraine. Also, morainal knobs do not occur. Lodgement till weathers mainly to clay loam or loam. Xenia soils formed in loess and in the underlying lodgement till.

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 first. Finer particles, such as very fine sand, silt, and clay, were carried by the more slowly moving water.

The outwash in Montgomery County is on till plains, stream terraces, outwash plains, and kames. The stream terraces are dominantly along Sugar, Walnut, and Big Raccoon Creeks. The outwash on these terraces generally has no material finer textured than sand and has some pebbles more than 3 inches in size. The terraces are at several elevations, probably because of different episodes of discharge from the glacier. Boyer soils are an example of soils that formed in outwash on stream terraces.

The outwash plains in Montgomery County are along Black and Coal Creeks. They formed as streams carried coarse textured outwash from within the melting glacier. Compared to the width of the outwash plains, the present-day channels are quite narrow. The outwash on these plains tends to have slightly more silt and clay particles than the outwash on terraces. Rush Variant soils, which are on outwash plains and terraces, formed in silty material and in the underlying outwash.

A prominent topographic feature in much of the west-central, northwestern, and east-central parts of the county is the Crawfordsville moraine. Small kames made up of outwash material are on this moraine. The outwash material has not moved very far and consequently is not sorted so well as the outwash on terraces and outwash plains. The outwash on some of the kames has layers of finer textured material, which do not occur in the outwash on terraces and outwash plains. Ockley silt loam, kame, 2 to 6 percent slopes, eroded, is an example of a soil that formed in outwash on kames.

Lacustrine material was deposited from still, or ponded, glacial meltwater. The coarser fragments dropped out of moving water as outwash, and only the finer particles, such as very fine sand, silt, and clay, remained to settle out in still water. The lacustrine deposits in Montgomery County are dominantly silty or clayey but have thin lenses of sand. They are mainly in potholes on till plains and outwash plains. Milford soils are an example of soils that formed in lacustrine material.

Determining whether the upper part of the soil formed in loess or in silty lacustrine material is difficult in much of the county north of the Crawfordsville moraine, particularly in areas of the poorly and very poorly drained soils in depressions. The effect of lacustrine material also is noticeable in the somewhat poorly drained soils on rises but not to the degree evident in the depressions.

Alluvial material was recently deposited by floodwater along streams. This material varies in texture, depending on the speed of the water from which it was deposited. The alluvium in Montgomery County is dominantly loamy and sandy. In the southwest corner, however, much of it is silty. Stonelick soils formed in alluvium.

Organic deposits consist of partially decomposed plant remains. After the glaciers withdrew from the area, water was left standing in lakes and in depressions on outwash plains and till plains. Grasses and sedges growing in these shallow lakes died, and their remains fell to the bottom. Because of the wetness of these areas, the plant remains did not decompose quickly. Later, white cedar and other water-tolerant trees grew in the areas. As these trees died, their residue became part of the organic accumulation. The lakes eventually filled with organic material and developed into areas of muck. The plant remains subsequently decomposed. In some areas the material has changed little since deposition. Inorganic deposits of coprogenous earth and marl commonly underlie the organic deposits in depressions. They formed during an open-water stage of bog development. Muskego soils formed in muck and coprogenous earth.

Loess is fine grained material consisting dominantly of silt-size particles. The loess in Montgomery County was carried by wind from western sources, possibly the valley of the Wabash River, and from local streams. The thickest deposits are in the southwestern part of the county. They are about 4 to 6 feet thick on convex slopes. Some loess was transported by water after it was originally deposited. These silty deposits are as much as 10 feet thick in depressions. Reesville soils are an example of soils that formed in loess.

Bedrock residuum occurs only in a few areas in the southwest corner of the county. Shadeland soils formed partly in material weathered from siltstone and sandstone, and Weikert soils formed entirely in material weathered from sandstone, siltstone, and shale.

Plant and Animal Life

Plants have been the principal organisms influencing the soils in the county. Bacteria, fungi, earthworms, and animals, however, also have been important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew on the soil in the past. The remains of these plants accumulated on the surface and in the soil, decayed, and eventually became organic matter. Plant roots provided channels for the downward movement of water through the soil and added organic matter and plant nutrients as they decayed.

Most of the county was originally very heavily forested, except for the prairie area in the northern part. On the well drained Miami and Russell soils, sugar maple, walnut, poplar, hickory, beech, and several kinds of oak were the dominant varieties of trees. Elm, ash, gum, and white oak were common on poorly drained soils. A few wet soils also supported sphagnum and other mosses, which contributed substantially to the accumulation of organic matter. Ragsdale and Milford soils formed under wet conditions.

Much of the northern part of the county was covered by native bluegrass and prairie grasses. Many islandlike groves of oak, however, were on slightly elevated knolls, and numerous patches of small timber were in the higher areas. The wide flats and all the depressions were either marshes or ponds during much of the year. Raub soils formed under prairie vegetation on rises. Drummer soils formed under marsh vegetation in depressions.

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 translocation of the soil material, and the rate of chemical reactions in the soil.

The climate in Montgomery County is midcontinental. It is characterized by wide variations in temperature from summer to winter. It is presumably similar to the climate under which the soils formed. The climate is uniform throughout the county. As a result, it has not caused major differences among the soils within the county.

Relief

Relief has markedly affected the soils in the county through its effect on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes range from 0 to 90 percent. Runoff is most rapid on the steeper slopes. Water is temporarily ponded in many low areas.

Natural soil drainage in the county generally ranges from well drained on the ridgetops to very poorly drained in the depressions. Through its effect on aeration in the soil, drainage determines the color of the soil. Water and air move freely through most well drained soils and slowly through most very poorly drained soils. In Ockley and other well drained, well aerated soils, the iron compounds that give most soils their color are brightly colored and oxidized. Milford and other poorly aerated, very poorly drained soils are dull gray and mottled because they have no brightly colored iron compounds or because the iron is in a reduced state.

Time

A long time is required for the agents of soil formation to form distinct horizons in the parent material. Differences in the 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 Montgomery County range from young to mature. The glacial deposits in which many of the soils formed have been exposed to the soil-forming factors long enough for the development of distinct horizons. Some soils that formed in recent alluvial material, however, have not been in place long enough for distinct horizons to develop. Stonelick soils are an example.

The soils south of the Crawfordsville moraine appear to be older and more extensively leached than those north of the moraine. The Bt horizon is more strongly expressed, silt coatings are thicker, and the upper part of the solum is more acid.

Russell soils show the effect of time on the leaching of lime. The parent material in which these soils formed was calcareous, but the soils are leached to a depth of 40 to 70 inches. Milford Variant soils, which were submerged under water and thus were protected from leaching much of the time, are leached to a depth of 12 to 35 inches. In contrast, the Starks soils, which were above water, are leached to a depth of more than 40 inches.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in Montgomery County. These processes are the accumulation of organic matter; the dissolution, transfer, and removal of calcium carbonates and bases; the liberation and translocation of silicate clay minerals; and the reduction and transfer of iron. In most of the 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 in some soils is low, but that in others is high. Generally, the soils that have the most organic matter, such as Treaty and Mahalasville soils, have a thick, dark 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. Nearly all of the carbonates and 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.

Clay accumulates in pores and other voids and forms films on the surfaces 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 to somewhat poorly drained soils in the county. In the naturally wet soils, this process has significantly affected horizon differentiation. A grayish color in the subsoil indicates the reduction of iron oxide. This reduction is commonly accompanied by the transfer and redistribution of the iron from upper horizons to lower ones or completely out of the profile. Mottles, which are in some horizons, indicate the segregation of iron.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols., illus.

(2) American Society for Testing and Materials. 1985. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Indiana Department of Natural Resources. 1979. Ground water resources of west-central Indiana—preliminary report: Montgomery County. Div. of Water, Bull. 27, 152 pp., illus.

(4) Jones, Grove B., and C.H. Orahood. 1914. Soil survey of Montgomery County, Indiana. 1914. U.S. Dep. Agric., Bur. of Soils, 26 pp., illus.

(5) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(6) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(7) United States Department of Commerce, Bureau of the Census. 1981. Census of population and housing. PHC80-V-16, illus.

(8) United States Department of Commerce, Bureau of the Census. 1983. 1982 census of agriculture—preliminary report: Montgomery County, Indiana. AC82-A-18-107(P), 4 pp., illus.

(9) Wayne, William J. 1956. Thickness of drift and bedrock physiography of Indiana north of the Wisconsin glacial boundary. Indiana Dep. of Conserv., Geol. Surv. Prog. Rep. 7, 70 pp., illus.

(10) Wayne, William J. 1965. The Crawfordsville and Knightstown moraines in Indiana. Indiana Dep. of Conserv., Geol. Surv. Prog. Rep. 28, 15 pp., illus.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

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.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

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.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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-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.

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.

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.

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.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

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.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

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.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (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.

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.

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.

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.

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.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

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

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

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.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface inlet riser. A pipe intake that extends above the ground and directs surface or ponded water into an underground outlet.

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.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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 Crawfordsville, 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----	34.8	16.7	25.8	64	-12	14	2.32	1.12	3.29	5	3.9
February---	38.7	19.6	29.2	64	-8	19	1.97	1.02	2.74	4	4.5
March------	48.0	28.0	38.0	78	6	117	3.03	1.54	4.24	7	3.1
April------	62.2	39.6	50.9	83	21	334	4.42	2.18	6.25	8	.5
May--------	72.9	48.9	60.9	91	29	648	4.35	2.50	5.85	8	.0
June-------	82.4	58.6	70.5	96	43	915	4.86	2.49	6.79	7	.0
July-------	85.9	62.5	74.2	97	48	1,060	4.42	2.63	6.02	7	.0
August-----	84.3	59.9	72.1	95	46	995	3.30	1.85	4.48	5	.0
September--	78.7	52.8	65.8	95	35	774	2.94	1.34	4.28	5	.0
October----	67.6	41.1	54.4	88	24	451	2.44	.99	3.60	5	.0
November---	50.9	31.0	41.0	76	11	104	3.14	1.66	4.34	6	1.5
December---	38.8	22.1	30.5	67	-7	55	2.97	.92	4.60	6	5.0
Yearly:											
Average--	62.1	40.1	51.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-14	---	---	---	---	---	---
Total----	---	---	---	---	---	5,486	40.16	35.16	45.00	73	18.5

* 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 Crawfordsville, 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. 13	Apr. 23	May 16
2 years in 10 later than--	Apr. 8	Apr. 19	May 10
5 years in 10 later than--	Mar. 30	Apr. 10	Apr. 28
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 22	Oct. 14	Oct. 4
2 years in 10 earlier than--	Oct. 26	Oct. 18	Oct. 9
5 years in 10 earlier than--	Nov. 4	Oct. 27	Oct. 17

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-74 at Crawfordsville, 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	199	181	150
8 years in 10	206	187	157
5 years in 10	218	199	171
2 years in 10	231	212	185
1 year in 10	237	218	192

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AfA	Alford silt loam, 0 to 2 percent slopes	717	0.2
Bc	Beckville loam, occasionally flooded	5,958	1.9
Be	Belleville loamy sand	322	0.1
BoA	Bowes Variant silt loam, 0 to 2 percent slopes	494	0.2
BpC3	Boyer gravelly sandy loam, 6 to 15 percent slopes, severely eroded	558	0.2
BrA	Brenton silt loam, 0 to 2 percent slopes	1,414	0.4
BxA	Brenton Variant silt loam, 0 to 2 percent slopes	786	0.2
CbA	Camden silt loam, 0 to 2 percent slopes	3,283	1.0
CbB	Camden silt loam, 2 to 6 percent slopes	4,394	1.4
CbC2	Camden silt loam, 6 to 12 percent slopes, eroded	1,396	0.4
CcF	Casco loam, 18 to 35 percent slopes	1,333	0.4
Ce	Ceresco loam, occasionally flooded	784	0.2
Cg	Chagrin silt loam, rarely flooded	406	0.1
Ck	Cohoctah loam, frequently flooded	2,341	0.7
CwA	Crosby silt loam, 0 to 2 percent slopes	8,111	2.5
CyB2	Crosby-Miami silt loams, 2 to 6 percent slopes, eroded	6,623	2.1
Cz	Cyclone silty clay loam	5,119	1.6
Du	Drummer silty clay loam	10,645	3.3
FdA	Fincastle silt loam, 0 to 2 percent slopes	14,228	4.4
FdB	Fincastle silt loam, 2 to 4 percent slopes	1,095	0.3
FgB2	Fincastle-Miami silt loams, 2 to 6 percent slopes, eroded	19,293	6.0
HeF	Hennepin silt loam, 18 to 50 percent slopes	5,332	1.7
HxF	Hennepin-Rock outcrop complex, 35 to 90 percent slopes	1,631	0.5
JaB	Jasper silt loam, till substratum, 2 to 6 percent slopes	956	0.3
Lb	Landes Variant fine sandy loam, rarely flooded	1,512	0.5
Lo	Lobdell silt loam, rarely flooded	576	0.2
Mb	Mahalasville silty clay loam	27,564	8.5
Mc	Mahalasville silty clay loam, gravelly substratum	6,089	1.9
MdD2	Martinsville-Ockley loams, till substrata, 12 to 18 percent slopes, eroded	951	0.3
MeB	Martinsville-Ockley silt loams, till substrata, 2 to 6 percent slopes	11,926	3.7
MeC	Martinsville-Ockley silt loams, till substrata, 6 to 12 percent slopes	3,655	1.1
MoC2	Miami silt loam, 6 to 12 percent slopes, eroded	2,804	0.9
MoE2	Miami silt loam, 15 to 25 percent slopes, eroded	1,195	0.4
MpC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	2,868	0.9
MpD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	373	0.1
MrC2	Miami-Xenia silt loams, 4 to 10 percent slopes, eroded	3,571	1.1
Ms	Milford silty clay loam, pothole	2,696	0.8
Mt	Milford Variant mucky silty clay	470	0.2
MuA	Millbrook silt loam, 0 to 2 percent slopes	1,037	0.3
MvA	Millbrook Variant silt loam, 0 to 2 percent slopes	293	0.1
Mw	Muskego muck, drained	472	0.1
My	Muskego muck, undrained	378	0.1
ObA	Ockley loam, 0 to 2 percent slopes	720	0.2
OcA	Ockley silt loam, 0 to 2 percent slopes	2,095	0.6
OcB	Ockley silt loam, 2 to 6 percent slopes	2,575	0.8
OcC2	Ockley silt loam, 6 to 12 percent slopes, eroded	432	0.1
OfB2	Ockley silt loam, kame, 2 to 6 percent slopes, eroded	2,322	0.7
OfC2	Ockley silt loam, kame, 6 to 12 percent slopes, eroded	1,568	0.5
OhB	Ockley loam, bedrock substratum, 1 to 4 percent slopes	346	0.1
OnB	Octagon loam, 2 to 6 percent slopes	887	0.3
OnC	Octagon loam, 6 to 12 percent slopes	373	0.1
OsB	Ormas loamy sand, 1 to 4 percent slopes	721	0.2
Pd	Palms muck, drained	690	0.2
PfB	Parr silt loam, 2 to 6 percent slopes	934	0.3
Ph	Pella silty clay loam	579	0.2
Po	Pits, gravel	359	0.1
Pq	Pits, quarries	66	*
PrA	Proctor silt loam, moderately wet, 0 to 2 percent slopes	953	0.3
PrB	Proctor silt loam, 2 to 6 percent slopes	1,289	0.4
Ra	Ragsdale silty clay loam	8,600	2.7
ReA	Raub silt loam, 0 to 2 percent slopes	2,594	0.8
RlA	Reesville silt loam, 0 to 2 percent slopes	14,364	4.4
RnA	Reesville-Fincastle silt loams, 0 to 2 percent slopes	19,949	6.2

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
RoG	Rodman-Rock outcrop complex, 35 to 70 percent slopes	516	0.2
RtA	Rush silt loam, 0 to 1 percent slopes	4,194	1.3
RtB	Rush silt loam, 2 to 6 percent slopes	1,138	0.4
RwA	Rush Variant silt loam, 0 to 2 percent slopes	687	0.2
RxC	Russell silt loam, 6 to 12 percent slopes	1,489	0.5
Sa	Saranac silty clay loam, gravelly substratum, frequently flooded	318	0.1
Sb	Saranac silty clay loam, gravelly substratum, occasionally flooded	461	0.1
SdB	Shadeland silt loam, 1 to 4 percent slopes	355	0.1
Sf	Shoals silt loam, occasionally flooded	1,367	0.4
SlA	Starks silt loam, 0 to 2 percent slopes	20,532	6.3
SrA	Starks-Crosby silt loams, 0 to 2 percent slopes	23,728	7.3
StB	St. Charles silt loam, 2 to 6 percent slopes	2,388	0.7
Su	Stonelick silt loam, occasionally flooded	1,807	0.6
Sv	Stonelick Variant fine sandy loam, frequently flooded	1,469	0.5
TgA	Toronto silt loam, 0 to 2 percent slopes	1,375	0.4
Ty	Treaty silty clay loam	6,026	1.9
Ud	Udorthents, loamy	728	0.2
Wa	Wallkill silt loam	238	0.1
Wb	Washtenaw silt loam, frequently flooded	1,748	0.5
WcA	Waupecan silt loam, 0 to 2 percent slopes	392	0.1
WdA	Waynetown silt loam, 0 to 2 percent slopes	3,175	1.0
WeB	Wea silt loam, 2 to 6 percent slopes	672	0.2
WfG	Weikert-Rock outcrop complex, 35 to 80 percent slopes	990	0.3
WkA	Whitaker silt loam, till substratum, 0 to 2 percent slopes	1,568	0.5
XgB2	Xenia-Birkbeck silt loams, 2 to 6 percent slopes, eroded	17,685	5.5
	Water areas more than 40 acres in size	409	0.1
	Total	323,520	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
AfA	Alford silt loam, 0 to 2 percent slopes
Bc	Beckville loam, occasionally flooded
BoA	Bowes Variant silt loam, 0 to 2 percent slopes
BrA	Brenton silt loam, 0 to 2 percent slopes (where drained)
BxA	Brenton Variant silt loam, 0 to 2 percent slopes (where drained)
CbA	Camden silt loam, 0 to 2 percent slopes
CbB	Camden silt loam, 2 to 6 percent slopes
Ce	Ceresco loam, occasionally flooded (where drained)
Cg	Chagrin silt loam, rarely flooded
Ck	Cohoctah loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
CwA	Crosby silt loam, 0 to 2 percent slopes (where drained)
CyB2	Crosby-Miami silt loams, 2 to 6 percent slopes, eroded (where drained)
Cz	Cyclone silty clay loam (where drained)
Du	Drummer silty clay loam (where drained)
FdA	Fincastle silt loam, 0 to 2 percent slopes (where drained)
FdB	Fincastle silt loam, 2 to 4 percent slopes (where drained)
FgB2	Fincastle-Miami silt loams, 2 to 6 percent slopes, eroded (where drained)
JaB	Jasper silt loam, till substratum, 2 to 6 percent slopes
Lo	Lobdell silt loam, rarely flooded
Mb	Mahalasville silty clay loam (where drained)
Mc	Mahalasville silty clay loam, gravelly substratum (where drained)
MeB	Martinsville-Ockley silt loams, till substrata, 2 to 6 percent slopes
MuA	Millbrook silt loam, 0 to 2 percent slopes (where drained)
MvA	Millbrook Variant silt loam, 0 to 2 percent slopes (where drained)
ObA	Ockley loam, 0 to 2 percent slopes
OcA	Ockley silt loam, 0 to 2 percent slopes
OcB	Ockley silt loam, 2 to 6 percent slopes
OfB2	Ockley silt loam, kame, 2 to 6 percent slopes, eroded
OhB	Ockley loam, bedrock substratum, 1 to 4 percent slopes
OnB	Octagon loam, 2 to 6 percent slopes
PfB	Parr silt loam, 2 to 6 percent slopes
Ph	Pella silty clay loam (where drained)
PrA	Proctor silt loam, moderately wet, 0 to 2 percent slopes
PrB	Proctor silt loam, 2 to 6 percent slopes
Ra	Ragsdale silty clay loam (where drained)
ReA	Raub silt loam, 0 to 2 percent slopes (where drained)
RlA	Reesville silt loam, 0 to 2 percent slopes (where drained)
RnA	Reesville-Fincastle silt loams, 0 to 2 percent slopes (where drained)
RtA	Rush silt loam, 0 to 1 percent slopes
RtB	Rush silt loam, 2 to 6 percent slopes
RwA	Rush Variant silt loam, 0 to 2 percent slopes
Sa	Saranac silty clay loam, gravelly substratum, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sb	Saranac silty clay loam, gravelly substratum, occasionally flooded (where drained)
SdB	Shadeland silt loam, 1 to 4 percent slopes (where drained)
Sf	Shoals silt loam, occasionally flooded (where drained)
SlA	Starks silt loam, 0 to 2 percent slopes (where drained)
SrA	Starks-Crosby silt loams, 0 to 2 percent slopes (where drained)
StB	St. Charles silt loam, 2 to 6 percent slopes
Su	Stonelick silt loam, occasionally flooded
TgA	Toronto silt loam, 0 to 2 percent slopes (where drained)
Ty	Treaty silty clay loam (where drained)
Wb	Washtenaw silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
WcA	Waupecan silt loam, 0 to 2 percent slopes
WdA	Waynetown silt loam, 0 to 2 percent slopes (where drained)
WeB	Wea silt loam, 2 to 6 percent slopes
WkA	Whitaker silt loam, till substratum, 0 to 2 percent slopes (where drained)
XgB2	Xenia-Birkbeck silt loams, 2 to 6 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	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
AfA------------------------ Alford	I	130	45	55	4.1	8.2
Bc------------------------ Beckville	IIw	90	32	45	3.5	7.0
Be------------------------ Belleville	IIIw	90	32	45	3.5	7.0
BoA------------------------ Bowes Variant	I	135	45	55	4.1	7.8
BpC3------------------------ Boyer	IVe	70	24	30	2.6	5.2
BrA------------------------ Brenton	IIw	140	47	62	5.9	9.0
BxA------------------------ Brenton Variant	IIw	140	45	55	5.4	8.5
CbA------------------------ Camden	I	125	39	55	5.0	10.0
CbB------------------------ Camden	IIe	124	39	54	5.0	10.0
CbC2------------------------ Camden	IIIe	117	37	52	4.7	9.4
CcF------------------------ Casco	VIIe	---	---	---	---	---
Ce------------------------ Ceresco	IIIw	105	38	35	4.0	8.0
Cg------------------------ Chagrin	I	135	42	50	4.5	9.0
Ck------------------------ Cohoctah	IIIw	100	33	40	3.1	6.2
CwA------------------------ Crosby	IIw	110	40	50	3.4	6.8
CyB2------------------------ Crosby-Miami	IIe	102	36	46	3.3	6.4
Cz------------------------ Cyclone	IIw	155	54	55	5.1	10.2
Du------------------------ Drummer	IIw	154	51	61	5.5	10.0
FdA------------------------ Fincastle	IIw	130	46	52	4.3	8.6

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	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
FdB----------------------- Fincastle	IIe	125	45	50	4.3	8.6
FgB2---------------------- Fincastle-Miami	IIe	117	41	49	3.9	7.6
HeF----------------------- Hennepin	VIe	---	---	---	1.8	---
HxF**--------------------- Hennepin-Rock outcrop	VIIe	---	---	---	---	---
JaB----------------------- Jasper	IIe	125	40	55	4.1	7.8
Lb------------------------ Landes Variant	IIIs	85	25	45	3.0	5.5
Lo------------------------ Lobdell	I	125	42	44	4.5	---
Mb, Mc-------------------- Mahalasville	IIw	155	54	62	5.1	10.2
MdD2---------------------- Martinsville-Ockley	IVe	88	31	34	2.8	5.3
MeB----------------------- Martinsville-Ockley	IIe	110	39	42	3.4	6.5
MeC----------------------- Martinsville-Ockley	IIIe	100	35	38	3.1	5.9
MoC2---------------------- Miami	IIIe	95	33	43	3.1	6.2
MoE2---------------------- Miami	VIe	---	---	---	2.3	4.6
MpC3---------------------- Miami	IVe	90	32	40	3.0	6.0
MpD3---------------------- Miami	VIe	80	28	36	2.6	5.2
MrC2---------------------- Miami-Xenia	IIIe	102	35	44	3.3	6.6
Ms------------------------ Milford	IVw	60	25	---	---	---
Mt------------------------ Milford Variant	IVw	70	30	---	---	---
MuA----------------------- Millbrook	IIw	135	47	54	4.5	9.0
MvA----------------------- Millbrook Variant	IIw	125	40	51	4.5	9.0

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	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Mw------------------------ Muskego	IVw	90	35	---	---	---
My------------------------ Muskego	VIw	---	---	---	---	---
ObA, OcA----------------- Ockley	I	110	38	44	3.6	7.2
OcB----------------------- Ockley	IIe	110	38	44	3.6	7.2
OcC2---------------------- Ockley	IIIe	95	33	38	3.1	6.2
OfB2---------------------- Ockley	IIe	105	37	42	3.4	6.8
OfC2---------------------- Ockley	IIIe	95	33	38	3.1	6.2
OhB----------------------- Ockley	IIe	100	33	38	3.3	6.3
OnB----------------------- Octagon	IIe	115	40	52	3.8	7.6
OnC----------------------- Octagon	IIIe	105	37	47	3.4	6.8
OsB----------------------- Ormas	IIIs	60	21	30	2.0	4.0
Pd------------------------ Palms	IIIw	105	42	---	---	---
PfB----------------------- Parr	IIe	120	42	54	4.0	8.0
Ph------------------------ Pella	IIw	140	48	56	5.2	---
Po**, Pq**. Pits						
PrA----------------------- Proctor	I	144	44	59	5.5	11.0
PrB----------------------- Proctor	IIe	143	44	58	5.4	10.8
Ra------------------------ Ragsdale	IIw	155	54	62	5.1	10.2
ReA----------------------- Raub	IIw	140	49	56	4.6	9.2
RlA----------------------- Reesville	IIw	130	46	52	5.0	10.0

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	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
RnA: Reesville-Fincastle	IIw	130	46	52	4.7	9.4
RoG**: Rodman-Rock outcrop	VIIs	---	---	---	---	---
RtA: Rush	I	125	44	50	4.1	8.2
RtB: Rush	IIe	125	44	50	4.1	8.2
RwA: Rush Variant	I	125	45	55	4.1	8.0
RxC: Russell	IIIe	110	38	44	3.6	7.2
Sa: Saranac	Vw	---	---	---	3.5	6.7
Sb: Saranac	IIIw	100	33	---	3.5	6.7
SdB: Shadeland	IIe	100	35	50	3.3	6.6
Sf: Shoals	IIw	110	38	44	4.3	8.6
SlA: Starks	IIw	129	40	55	5.1	10.2
SrA: Starks-Crosby	IIw	123	40	54	4.5	9.0
StB: St. Charles	IIe	126	39	55	5.0	10.0
Su: Stonelick	IIw	80	28	35	3.5	7.0
Sv: Stonelick Variant	IVw	50	25	---	2.5	4.1
TgA: Toronto	IIw	135	47	54	4.4	8.8
Ty: Treaty	IIw	150	52	65	4.8	9.6
Ud**. Udorthents						
Wa: Wallkill	IIIw	115	45	40	4.5	9.0
Wb: Washtenaw	IIw	130	46	52	4.3	8.6

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	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
WcA: Waupecan	I	130	45	62	5.3	10.6
WdA: Waynetown	IIw	125	45	50	4.0	8.0
WeB: Wea	IIe	120	42	48	4.0	8.0
WfG**: Weikert-Rock outcrop	VIIe	---	---	---	---	---
WkA: Whitaker	IIw	120	40	52	4.3	8.2
XgB2: Xenia-Birkbeck	IIe	118	40	50	4.3	---

* 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	14,517	---	---	---	---
II	263,534	74,878	188,656	---	---
III	22,357	15,288	4,836	2,233	---
IV	9,484	4,377	5,107	---	---
V	318	---	318	---	---
VI	7,278	6,900	378	---	---
VII	4,470	3,954	---	516	---
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*	
AfA------------- Alford	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, black locust.
Bc-------------- Beckville	7A	Slight	Slight	Slight	Slight	Yellow-poplar------- White ash----------- Eastern cottonwood-- Black walnut--------	95 --- --- ---	98 --- --- ---	Eastern white pine, yellow-poplar, black walnut.
Be-------------- Belleville	1W	Slight	Severe	Severe	Moderate	Silver maple-------- Red maple----------- White ash----------- Pin oak------------- Swamp white oak-----	64 --- --- --- ---	20 --- --- --- ---	
BpC3------------ Boyer	4A	Slight	Slight	Slight	Slight	White oak----------- Red pine------------ Eastern white pine-- Jack pine----------- Northern red oak----	70 75 65 68 75	52 142 136 102 57	Eastern white pine, red pine.
CbA, CbB, CbC2-- Camden	7A	Slight	Slight	Slight	Slight	Yellow-poplar------- White oak----------- Northern red oak---- Sweetgum------------ Green ash-----------	95 85 85 80 76	98 67 67 79 89	White oak, black walnut, green ash, eastern white pine, red pine, yellow-poplar, black locust, white ash.
CcF------------- Casco	4R	Moderate	Moderate	Moderate	Moderate	White oak----------- Red pine------------ Eastern white pine-- Jack pine-----------	70 78 85 68	52 150 196 102	Eastern white pine, red pine.
Ce-------------- Ceresco	3W	Slight	Moderate	Slight	Slight	Northern red oak---- White ash----------- Red maple----------- Silver maple-------- Eastern cottonwood-- American sycamore--- Black walnut--------	66 --- --- --- --- --- ---	48 --- --- --- --- --- ---	Eastern white pine, white spruce, black walnut.
Cg-------------- Chagrin	5A	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Sugar maple--------- White oak----------- Black cherry-------- White ash----------- Black walnut--------	86 96 86 --- --- --- ---	68 100 39 --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
Ck--------------- Cohoctah	3W	Slight	Severe	Severe	Severe	Red maple----------- Silver maple-------- Pin oak------------- Green ash----------- Eastern cottonwood-- Black cherry-------- Swamp white oak-----	72 95 --- 70 --- --- ---	44 46 --- 75 --- --- ---	Pin oak, green ash, red maple, American sycamore, swamp white oak.
CwA------------- Crosby	4A	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Northern red oak----	75 85 85 75	57 67 81 57	Eastern white pine, northern red oak, white ash, red maple, yellow-poplar, American sycamore.
CyB2**:									
Crosby----------	4A	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Northern red oak----	75 85 85 75	57 67 81 57	Eastern white pine, northern red oak, white ash, red maple, yellow-poplar, American sycamore.
Miami-----------	4A	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Cz--------------- Cyclone	5W	Slight	Severe	Severe	Severe	Pin oak------------- White oak----------- Sweetgum------------	90 75 90	72 57 106	Eastern white pine, red maple, white ash.
FdA, FdB--------- Fincastle	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	75 75 85 85 80	57 57 72 81 79	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
FgB2**:									
Fincastle-------	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	75 75 85 85 80	57 57 67 81 79	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Miami-----------	4A	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
HeF: Hennepin	5R	Moderate	Moderate	Slight	Slight	Northern red oak White oak	85 ---	67 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine, eastern redcedar.
HxF**:									
Hennepin	5R	Severe	Severe	Slight	Slight	Northern red oak White oak	85 ---	67 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine, eastern redcedar.
Rock outcrop.									
Lb: Landes Variant	7A	Slight	Slight	Slight	Slight	Yellow-poplar Eastern cottonwood American sycamore Sweetgum Green ash Black walnut	95 105 --- --- --- ---	98 141 --- --- --- ---	Eastern cottonwood, yellow-poplar, green ash, black walnut, eastern white pine, sugar maple.
Lo: Lobdell	5A	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple White ash White oak Black cherry	87 96 --- --- --- ---	69 100 --- --- --- ---	Eastern white pine, white oak, yellow-poplar, white ash, red pine, northern red oak.
Mb: Mahalasville	5W	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	85 75 90	67 57 106	Eastern white pine, red maple, white ash.
Mc: Mahalasville	5W	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	85 75 90	67 57 106	Eastern white pine, red maple, white ash, silver maple.
MdD2**, MeB**, MeC**:									
Martinsville	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar	90 90 98	72 72 104	Eastern white pine, white ash, yellow-poplar, black walnut.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
MdD2**, MeB**, MeC**:									
Ockley	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 98 76	72 72 104 70	Eastern white pine, white ash, yellow-poplar, black walnut, black locust.
MoC2 Miami	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MoE2 Miami	5R	Moderate	Moderate	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MpC3, MpD3 Miami	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MrC2**:									
Miami	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Xenia	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, black walnut, black locust, yellow-poplar, white ash.
MuA Millbrook	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, sugar maple.
MvA Millbrook Variant	4A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar	80 80 90	62 62 90	White oak, black walnut, northern red oak, sugar maple.

See footnotes 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
Mw, My Muskego	2W	Slight	Severe	Severe	Severe	Tamarack	50	42	
						Red maple	51	33	
						White ash	52	30	
						Green ash	---	---	
						Black willow	---	---	
						Quaking aspen	56	56	
						Silver maple	---	---	
ObA, OcA, OcB, OcC2, OfB2, OfC2 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	
OhB Ockley	5A	Slight	Slight	Slight	Slight	White oak	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
						Northern red oak	90	72	
						Yellow-poplar	98	104	
						Sweetgum	76	70	
OsB Ormas	4S	Slight	Slight	Moderate	Slight	White oak	70	52	Eastern white pine, red pine, yellow-poplar, black walnut.
						Yellow-poplar	---	---	
						Eastern white pine	---	---	
						Red pine	78	150	
Pd Palms	2W	Slight	Severe	Severe	Severe	White ash	51	28	
						Red maple	51	33	
						Quaking aspen	56	56	
						Black willow	---	---	
						Silver maple	76	30	
Ra Ragsdale	5W	Slight	Severe	Severe	Severe	Pin oak	90	72	Eastern white pine, swamp white oak, red maple, white ash.
						White oak	75	57	
						Sweetgum	90	106	
RlA Reesville	4W	Slight	Moderate	Slight	Slight	Northern red oak	76	58	Red maple, silver maple, pin oak, red pine, swamp white oak, green ash, American sycamore.
						Yellow-poplar	86	82	
						Sugar maple	90	55	
						Green ash	---	---	
						Swamp white oak	---	---	
						Black cherry	---	---	
						Red maple	---	---	
						Pin oak	---	---	
						Eastern cottonwood	---	---	
RnA**: Reesville	4W	Slight	Moderate	Slight	Slight	Northern red oak	76	58	Red maple, silver maple, pin oak, red pine, swamp white oak, green ash, American sycamore.
						Yellow-poplar	86	82	
						Sugar maple	90	55	
						Green ash	---	---	
						Swamp white oak	---	---	
						Black cherry	---	---	
						Red maple	---	---	
						Pin oak	---	---	
						Eastern cottonwood	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
RnA**:									
Fincastle	4A	Slight	Slight	Slight	Slight	Northern red oak White oak Pin oak Yellow-poplar Sweetgum	75 75 85 85 80	57 57 67 81 79	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
RoG**:									
Rodman	4R	Severe	Severe	Severe	Slight	Northern red oak White oak Red pine Eastern white pine	70 70 75 85	52 52 142 196	Eastern white pine, red pine.
Rock outcrop.									
RtA, RtB Rush	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 98 ---	72 72 104 ---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
RwA Rush Variant	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar	90 90 98	72 72 104	Red pine, eastern white pine, white ash, black walnut.
RxC Russell	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 96 76	72 72 100 70	Eastern white pine, white ash, yellow-poplar, black walnut, white oak, northern red oak, green ash, black cherry.
Sa, Sb Saranac	2W	Slight	Severe	Severe	Severe	Red maple Swamp white oak Silver maple Green ash White ash American basswood	55 --- --- --- --- ---	35 --- --- --- --- ---	Eastern white pine, white ash, white spruce, red maple.
SdB Shadeland	4A	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum	75 85 85 80	57 67 81 79	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Sf Shoals	5W	Slight	Moderate	Moderate	Slight	Pin oak Sweetgum Yellow-poplar Virginia pine Eastern cottonwood White ash	90 86 90 90 --- ---	72 95 90 135 --- ---	Red maple, swamp chestnut oak, pin oak, yellow-poplar.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
SlA: Starks	4A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	62 62 90 ---	Black walnut, American sycamore, yellow-poplar, white oak, green ash, sugar maple.
SrA**:									
Starks	4A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	62 62 90 ---	Black walnut, American sycamore, yellow-poplar, white oak, green ash, sugar maple.
Crosby	4A	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Northern red oak	75 85 85 75	56 67 81 56	Eastern white pine, northern red oak, white ash, red maple, yellow-poplar, American sycamore.
StB: St. Charles	7A	Slight	Slight	Slight	Slight	Yellow-poplar White oak Northern red oak Sweetgum Green ash	95 85 85 --- ---	98 67 67 --- ---	White oak, black walnut, sugar maple, eastern white pine, red pine.
Su: Stonelick	7A	Slight	Slight	Slight	Slight	Yellow-poplar Northern red oak White oak Black walnut Black cherry Sugar maple White ash	95 80 --- --- --- --- ---	98 62 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
Sv: Stonelick Variant	10A	Slight	Slight	Slight	Slight	Eastern cottonwood American sycamore Sweetgum Green ash Black walnut	105 --- --- --- ---	141 --- --- --- ---	Eastern cottonwood, yellow-poplar, green ash, black walnut, eastern white pine, sugar maple.
Ty: Treaty	5W	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum Northern red oak	90 75 90 ---	72 57 106 ---	Eastern white pine, swamp white oak, red maple, white ash.
Wa: Wallkill	3W	Slight	Severe	Severe	Severe	Pin oak Red maple White ash	65 51 52	48 33 30	Red maple, green ash, swamp white oak.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
Wb------------- Washtenaw	5W	Slight	Severe	Severe	Moderate	Pin oak------------	86	68	Eastern white pine, red maple, white ash, white spruce.
						Northern red oak----	75	57	
						Sweetgum-----------	90	106	
						Red maple-----------	70	43	
						Silver maple--------	---	---	
						White ash-----------	---	---	
						American basswood---	---	---	
						White oak-----------	---	---	
WdA------------- Waynetown	5A	Slight	Slight	Slight	Slight	Pin oak------------	85	67	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Yellow-poplar-------	85	81	
						Sweetgum-----------	80	79	
						White oak-----------	75	57	
WfG**:									
Weikert--------	3R	Moderate	Severe	Severe	Moderate	Northern red oak----	64	47	Eastern white pine, Virginia pine.
						Virginia pine-------	60	91	
Rock outcrop.									
WkA------------- Whitaker	4A	Slight	Slight	Slight	Slight	White oak-----------	70	52	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak------------	85	67	
						Yellow-poplar-------	85	81	
						Sweetgum-----------	80	79	
						Northern red oak----	75	57	
XgB2**:									
Xenia----------	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar-------	98	104	
						Sweetgum-----------	76	70	
Birkbeck-------	5A	Slight	Slight	Slight	Slight	White oak-----------	86	68	White oak, northern red oak, green ash, black walnut, eastern white pine, red pine.
						Northern red oak----	---	---	
						Green 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.

** See description of the map unit for composition and behavior characteristics of the map unit.

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
AfA----------------- Alford	---	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.
Bc----------------- Beckville	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Be----------------- Belleville	---	Silky dogwood, Amur privet, nannyberry viburnum, lilac, American cranberrybush.	White spruce, northern white-cedar, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.
BoA----------------- Bowes Variant	---	Amur privet, American cranberrybush, Amur honeysuckle, silky dogwood.	White fir, Washington hawthorn, blue spruce, Austrian pine, northern white-cedar.	Norway spruce-----	Eastern white pine, pin oak.
BpC3----------------- Boyer	Siberian peashrub	Tatarian honeysuckle, Amur honeysuckle, lilac, Washington hawthorn, radiant crabapple, autumn-olive, eastern redcedar.	Eastern white pine, red pine, Austrian pine, jack pine.	---	---
BrA----------------- Brenton	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
BxA----------------- Brenton Variant	---	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.
CbA, CbB, CbC2----- Camden	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

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
CcF: Casco	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn-olive, Washington hawthorn, Amur honeysuckle, Tatarian honeysuckle.	Eastern white pine, red pine, Austrian pine, jack pine.	---	---
Ce: Ceresco	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	Northern white-cedar, white fir, blue spruce, Washington hawthorn, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
Cg: Chagrin	---	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.
Ck: Cohoctah	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
CwA: Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
CyB2*:					
Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
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.

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
Cz: Cyclone	---	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.
Du: Drummer	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Norway spruce, Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine.	Eastern white pine	Pin oak.
FdA, FdB: 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.
FgB2*:					
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.
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.
HeF. Hennepin					
HxF*:					
Hennepin.					
Rock outcrop.					
JaB: Jasper	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern white-cedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
Lb: Landes Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

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
Lo----------------- Lobdell	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
Mb, Mc------------- 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.
MdD2*, MeB*, MeC*: Martinsville-----	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
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.
MoC2, MoE2, MpC3, MpD3------------- 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.
MrC2*: 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.
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.
Ms----------------- Milford	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Mt----------------- Milford Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn, Norway spruce.	Eastern white pine	Pin oak.

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
MuA: Millbrook	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
MvA: Millbrook Variant	---	Amur privet, American cranberrybush, Amur honeysuckle, silky dogwood.	Austrian pine, white fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Mw, My: Muskego	Common ninebark, whitebelle honeysuckle.	Amur privet, nannyberry viburnum, silky dogwood, Tatarian honeysuckle, Amur honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
ObA, OcA, OcB, OcC2, OfB2, OfC2, OhB: 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.
OnB, OnC: Octagon	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
OsB: Ormas	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn-olive, Washington hawthorn, Amur honeysuckle, Tatarian honeysuckle.	Red pine, Austrian pine, jack pine.	Eastern white pine	---
Pd: Palms	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
PfB: Parr	---	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 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
Ph----------------- Pella	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Po*, Pq*. Pits					
PrA, PrB---------- Proctor	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Ra----------------- 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.
ReA---------------- Raub	---	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.
RlA---------------- 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.
RnA*: 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.
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.
RoG*: Rodman.					
Rock outcrop.					
RtA, RtB---------- Rush	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

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
RwA. Rush Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
RxC. 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.
Sa. Saranac					
Sb. Saranac	Vanhoutte spirea	Silky dogwood, Tatarian honeysuckle, American cranberrybush, Amur privet, nannyberry viburnum, Roselow sargent crabapple.	White spruce	Norway spruce, eastern white pine.	Carolina poplar, pin oak.
SdB. Shadeland	---	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.
Sf. 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.
SlA. Starks	---	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.
SrA*:					
Starks	---	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.
Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---

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
StB---------------- St. Charles	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Su----------------- Stonelick	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, eastern redcedar, osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow------	---
Sv----------------- Stonelick Variant	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow------	---
TgA---------------- Toronto	---	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.
Ty----------------- 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.
Ud*. Udorthents					
Wa----------------- Wallkill	---	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.
Wb----------------- Washtenaw	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

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
WcA. Waupecan					
WdA: Waynetown	---	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.
WeB. Wea					
WfG*: Weikert	American hazel, flowering quince.	Blackhaw, cutleaf staghorn sumac, forsythia, autumn-olive.	Jack pine, Austrian pine, Russian-olive.	Virginia pine, red pine, scarlet oak.	---
Rock outcrop.					
WkA: Whitaker	---	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.
XgB2*: 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.
Birkbeck	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.

* 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
AfA-- Alford	Slight	Slight	Slight	Slight	Slight.
Bc-- Beckville	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
Be-- Belleville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
BoA-- Bowes Variant	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
BpC3-- Boyer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
BrA-- Brenton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
BxA-- Brenton Variant	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CbA-- Camden	Slight	Slight	Slight	Slight	Slight.
CbB-- Camden	Slight	Slight	Moderate: slope.	Slight	Slight.
CbC2-- Camden	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CcF-- Casco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ce-- Ceresco	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty, flooding.
Cg-- Chagrin	Severe: flooding.	Slight	Slight	Slight	Slight.
Ck-- Cohoctah	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: flooding, wetness.
CwA-- Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CyB2*: Crosby--	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

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
CyB2*:					
Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Cz: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Du: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
FdA, FdB: Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FgB2*:					
Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
HeF: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HxF*:					
Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
JaB: Jasper	Slight	Slight	Moderate: slope.	Slight	Slight.
Lb: Landes Variant	Severe: flooding.	Slight	Slight	Slight	Slight.
Lo: Lobdell	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
Mb, Mc: Mahalasville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MdD2*:					
Martinsville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Ockley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MeB*:					
Martinsville	Slight	Slight	Moderate: slope.	Slight	Slight.
Ockley	Slight	Slight	Moderate: slope.	Slight	Slight.
MeC*:					
Martinsville	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: 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
MeC*:					
Ockley	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MoC2 Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MoE2 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MpC3 Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MpD3 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MrC2*:					
Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Xenia	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Ms Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mt Milford Variant	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
MuA Millbrook	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
MvA Millbrook Variant	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Mw, My Muskego	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
ObA, OcA, OcB, OcC2, OfB2, OfC2. Ockley					
OhB Ockley	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
OnB Octagon	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
OnC Octagon	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: 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
OsB: Ormas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Pd: Palms	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
PfB: Parr	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Ph: Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Po*, Pq*. Pits					
PrA: Proctor	Slight	Slight	Slight	Slight	Slight.
PrB: Proctor	Slight	Slight	Moderate: slope.	Slight	Slight.
Ra: Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
ReA: Raub	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RlA: Reesville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RnA*:					
Reesville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RoG*:					
Rodman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
Rock outcrop.					
RtA: Rush	Slight	Slight	Slight	Slight	Slight.
RtB: Rush	Slight	Slight	Moderate: slope.	Slight	Slight.
RwA: Rush Variant	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
RxC: Russell	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: 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
Sa: Saranac	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Sb: Saranac	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
SdB: Shadeland	Severe: wetness.	Moderate: wetness, small stones, percs slowly.	Severe: small stones, wetness.	Moderate: wetness.	Moderate: small stones, wetness, depth to rock.
Sf: Shoals	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SlA: Starks	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
SrA*:					
Starks	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
StB: St. Charles	Slight	Slight	Moderate: slope.	Slight	Slight.
Su: Stonelick	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, flooding.
Sv: Stonelick Variant	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
TgA: Toronto	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ty: Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ud*. Udorthents					
Wa: Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, erodes easily.	Severe: ponding.
Wb: Washtenaw	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
WcA: Waupecan	Slight	Slight	Slight	Slight	Slight.
WdA: Waynetown	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.

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
WeB------------------ Wea	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
WfG*:					
Weikert--------------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, thin layer, small stones.
Rock outcrop.					
WkA------------------ Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
XgB2*:					
Xenia----------------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.
Birkbeck-------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	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
AfA: Alford	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Bc: Beckville	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
Be: Belleville	Very poor.	Poor	Poor	Poor	Poor	Fair	Good	Very poor.	Poor	Fair.
BoA: Bowes Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BpC3: Boyer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BrA: Brenton	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BxA: Brenton Variant	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CbA, CbB: Camden	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CbC2: Camden	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
CcF: Casco	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ce: Ceresco	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Cg: Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ck: Cohoctah	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
CwA: Crosby	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CyB2*:										
Crosby	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Cz: Cyclone	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Du: Drummer	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.

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
FdA-----------------Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FdB-----------------Fincastle	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FgB2*:										
Fincastle----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Miami--------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HeF-----------------Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
HxF*:										
Hennepin-----------	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
JaB-----------------Jasper	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lb------------------Landes Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lo------------------Lobdell	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Mb------------------Mahalasville	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Mc------------------Mahalasville	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor.
MdD2*:										
Martinsville-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ockley-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MeB*:										
Martinsville-------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ockley-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MeC*:										
Martinsville-------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ockley-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MoC2----------------Miami	Fair	Good	Good	Good	Good	Very 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							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
MoE2 Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MpC3 Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MpD3 Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MrC2*:										
Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Xenia	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ms Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mt Milford Variant	Fair	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair.
MuA Millbrook	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MvA Millbrook Variant	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Mw, My Muskego	Good	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
ObA, OcA, OcB Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OcC2 Ockley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
OfB2 Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OfC2 Ockley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
OhB Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OnB Octagon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OnC Octagon	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
OsB Ormas	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Pd Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
PfB Parr	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							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
Ph: Pella	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Po*, Pq*. Pits										
PrA, PrB: Proctor	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ra: Ragsdale	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor.
ReA: Raub	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RlA: Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RnA*:										
Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RoG*:										
Rodman	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
RtA, RtB: Rush	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RwA: Rush Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RxC: Russell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sa, Sb: Saranac	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
SdB: Shadeland	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Sf: Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
SlA: Starks	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
SrA*:										
Starks	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Crosby	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
StB: St. Charles	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Su: Stonelick	Fair	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							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
Sv----------------- Stonelick Variant	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
TgA----------------- Toronto	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ty----------------- Treaty	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ud*. Udorthents										
Wa----------------- Wallkill	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wb----------------- Washtenaw	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
WcA----------------- Waupecan	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WdA----------------- Waynetown	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WeB----------------- Wea	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WfG*: Weikert------------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Rock outcrop.										
WkA----------------- Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
XgB2*: Xenia------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Birkbeck-----------	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
AfA: Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Bc: Beckville	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Be: Belleville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
BoA: Bowes Variant	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
BpC3: Boyer	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
BrA: Brenton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
BxA: Brenton Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
CbA: Camden	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
CbB: Camden	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
CbC2: Camden	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
CcF: Casco	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ce: Ceresco	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, droughty, flooding.
Cg: Chagrin	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Ck: Cohoctah	Severe: wetness, cutbanks cave.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action, wetness.	Severe: flooding, wetness.

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
CwA-----------------Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
CyB2*:						
Crosby-------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Miami--------------	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
Cz-----------------Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Du-----------------Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
FdA, FdB-----------Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FgB2*:						
Fincastle----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Miami--------------	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
HeF----------------Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HxF*:						
Hennepin-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
JaB----------------Jasper	Moderate: dense layer.	Slight-----------	Slight-----------	Moderate: slope.	Moderate: frost action.	Slight.
Lb-----------------Landes Variant	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Lo-----------------Lobdell	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Slight.
Mb, Mc-------------Mahalasville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

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
MdD2*:						
Martinsville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Ockley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MeB*:						
Martinsville	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Ockley	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
MeC*:						
Martinsville	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Ockley	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MoC2 Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MoE2 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MpC3 Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MpD3 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MrC2*:						
Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
Xenia	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Ms Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

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
Mt: Milford Variant	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, too clayey.
MuA: Millbrook	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
MvA: Millbrook Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Mw, My: Muskego	Severe: excess humus, ponding.	Severe: ponding, low strength, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
ObA, OcA: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
OcB: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
OcC2: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
OfB2: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
OfC2: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
OhB: Ockley	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
OnB: Octagon	Moderate: dense layer.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
OnC: Octagon	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
OsB: Ormas	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
Pd: Palms	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action, subsides.	Severe: ponding, excess humus.
PfB: Parr	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	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
Ph----------------- Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Po*, Pq*. Pits						
PrA--------------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
PrB--------------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Ra----------------- Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
ReA--------------- Raub	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
RlA--------------- Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
RnA*: Reesville---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Fincastle---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
RoG*: Rodman------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Rock outcrop.						
RtA--------------- Rush	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
RtB--------------- Rush	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
RwA--------------- Rush Variant	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
RxC--------------- Russell	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: 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
Sa---------------- Saranac	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
Sb---------------- Saranac	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding.
SdB--------------- Shadeland	Severe: depth to rock, wetness.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: low strength, frost action.	Moderate: small stones, wetness, depth to rock.
Sf---------------- Shoals	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness.
SlA--------------- Starks	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
SrA*:						
Starks-----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Crosby-----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
StB--------------- St. Charles	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Su---------------- Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, flooding.
Sv---------------- Stonelick Variant	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
TgA--------------- Toronto	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ty---------------- Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Ud*. Udorthents						
Wa---------------- Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.

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
Wb---------------- Washtenaw	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding, flooding.	Severe: ponding, flooding.	Severe: ponding, frost action, flooding.	Severe: ponding, flooding.
WcA--------------- Waupecan	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
WdA--------------- Waynetown	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
WeB--------------- Wea	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
WfG*:						
Weikert-----------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, thin layer, small stones.
Rock outcrop.						
WkA--------------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
XgB2*:						
Xenia-------------	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Birkbeck----------	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	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
AfA: Alford	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Bc: Beckville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Be: Belleville	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
BoA: Bowes Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too clayey, small stones, wetness.
BpC3: Boyer	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
BrA: Brenton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BxA: Brenton Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
CbA: Camden	Slight	Moderate: seepage.	Severe: seepage.	Slight	Fair: thin layer.
CbB: Camden	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: thin layer.
CbC2: Camden	Moderate: slope.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: slope, too clayey.
CcF: Casco	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: slope, seepage.	Poor: too sandy, seepage, small stones.
Ce: Ceresco	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, thin layer.
Cg: Chagrin	Moderate: flooding, wetness.	Moderate: wetness, seepage.	Severe: wetness.	Moderate: flooding.	Good.

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
Ck: Cohoctah	Severe: wetness, flooding.	Severe: flooding, seepage, wetness.	Severe: seepage, flooding, wetness.	Severe: seepage, flooding, wetness.	Poor: wetness.
CwA: Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CyB2*:					
Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Miami	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Cz: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Du: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
FdA, FdB: Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
FgB2*:					
Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Miami	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
HeF: Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HxF*:					
Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Rock outcrop.					
JaB: Jasper	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Lb: Landes Variant	Moderate: flooding.	Severe: seepage, flooding.	Severe: seepage.	Severe: seepage.	Fair: too sandy, thin layer.
Lo: Lobdell	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.

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
Mb------------------ Mahalasville	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: hard to pack, ponding.
Mc------------------ Mahalasville	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
MdD2*:					
Martinsville-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ockley-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MeB*:					
Martinsville-------	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
Ockley-------------	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
MeC*:					
Martinsville-------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Ockley-------------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MoC2---------------- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MoE2---------------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MpC3---------------- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MpD3---------------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MrC2*:					
Miami--------------	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Xenia--------------	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, wetness.
Ms------------------ Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, 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
Mt----------------- Milford Variant	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
MuA---------------- Millbrook	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
MvA---------------- Millbrook Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Mw, My------------- Muskego	Severe: ponding, subsides.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: hard to pack, ponding.
ObA, OcA, OcB------- Ockley	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Poor: small stones.
OcC2--------------- Ockley	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: small stones.
OfB2--------------- Ockley	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Poor: small stones.
OfC2--------------- Ockley	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: small stones.
OhB---------------- Ockley	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: small stones.
OnB---------------- Octagon	Severe: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
OnC---------------- Octagon	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
OsB---------------- Ormas	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Pd----------------- Palms	Severe: subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
PfB---------------- Parr	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Ph----------------- Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Po*, Pq*. Pits					
PrA---------------- Proctor	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness.

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
PrB: Proctor	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
Ra: Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
ReA: Raub	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
RlA: Reesville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
RnA*:					
Reesville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
RoG*:					
Rodman	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Rock outcrop.					
RtA: Rush	Slight	Moderate: seepage.	Severe: seepage.	Slight	Fair: too clayey, small stones.
RtB: Rush	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey, small stones.
RwA: Rush Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: small stones, wetness, thin layer.
RxC: Russell	Moderate: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Sa, Sb: Saranac	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, ponding.	Poor: too clayey, ponding.
SdB: Shadeland	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Poor: depth to rock, wetness.
Sf: Shoals	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

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
SlA: Starks	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
SrA*:					
Starks	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
StB: St. Charles	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Su: Stonelick	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.
Sv: Stonelick Variant	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
TgA: Toronto	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ty: Treaty	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ud*. Udorthents					
Wa: Wallkill	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
Wb: Washtenaw	Severe: ponding, percs slowly, flooding.	Severe: ponding, flooding.	Severe: ponding, flooding.	Severe: ponding, flooding.	Poor: ponding.
WcA: Waupecan	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey, thin layer.
WdA: Waynetown	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
WeB: Wea	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey.
WfG*:					
Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, depth to rock, seepage.
Rock outcrop.					

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
WkA----------------- Whitaker	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
XgB2*:					
Xenia---------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Birkbeck------------	Severe: wetness.	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
AfA: Alford	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Bc: Beckville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Be: Belleville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BoA: Bowes Variant	Fair: wetness.	Probable	Probable	Fair: small stones, area reclaim.
BpC3: Boyer	Good	Probable	Probable	Poor: small stones, area reclaim.
BrA: Brenton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
BxA: Brenton Variant	Fair: wetness.	Probable	Probable	Fair: area reclaim.
CbA, CbB: Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CbC2: Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CcF: Casco	Poor: slope.	Probable	Probable	Poor: slope, area reclaim, small stones.
Ce: Ceresco	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Cg: Chagrin	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Ck: Cohoctah	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CwA: Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CyB2*:				
Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cz: Cyclone	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Du: Drummer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FdA, FdB: Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
FgB2*:				
Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
HeF: Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HxF*:				
Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
JaB: Jasper	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Lb: Landes Variant	Good	Probable	Improbable: too sandy.	Good.
Lo: Lobdell	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Mb: Mahalasville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mc: Mahalasville	Poor: wetness.	Probable	Probable	Poor: wetness.
MdD2*:				
Martinsville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ockley	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MeB*:				
Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ockley	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
MeC*:				
Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MeC*:				
Ockley	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
MoC2 Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MoE2 Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MpC3 Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MpD3 Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MrC2*:				
Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Ms Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mt Milford Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
MuA Millbrook	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
MvA Millbrook Variant	Fair: wetness.	Probable	Probable	Fair: area reclaim.
Mw, My Muskego	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
ObA, OcA, OcB, OcC2, OfB2, OfC2 Ockley	Good	Probable	Probable	Poor: small stones, area reclaim.
OhB Ockley	Fair: depth to rock, thin layer, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
OnB Octagon	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
OnC: Octagon	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
OsB: Ormas	Good	Probable	Probable	Fair: too sandy, small stones.
Pd: Palms	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.
PfB: Parr	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Ph: Pella	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Po*, Pq*. Pits				
PrA: Proctor	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
PrB: Proctor	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ra: Ragsdale	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ReA: Raub	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
RlA: Reesville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RnA*:				
Reesville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
RoG*:				
Rodman	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones.
Rock outcrop.				
RtA, RtB: Rush	Good	Probable	Probable	Fair: area reclaim.
RwA: Rush Variant	Fair: wetness.	Probable	Probable	Fair: area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RxC------------------ Russell	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Sa, Sb--------------- Saranac	Poor: wetness.	Probable------------	Probable------------	Poor: thin layer, wetness.
SdB------------------ Shadeland	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Sf------------------- Shoals	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SlA------------------ Starks	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
SrA*:				
Starks---------------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Crosby---------------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
StB------------------ St. Charles	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Su------------------- Stonelick	Good----------------	Probable------------	Improbable: too sandy.	Poor: small stones.
Sv------------------- Stonelick Variant	Good----------------	Probable------------	Probable------------	Poor: area reclaim.
TgA------------------ Toronto	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ty------------------- Treaty	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ud*. Udorthents				
Wa------------------- Wallkill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wb------------------- Washtenaw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
WcA------------------ Waupecan	Good----------------	Probable------------	Probable------------	Poor: area reclaim.
WdA------------------ Waynetown	Fair: wetness.	Probable------------	Probable------------	Fair: small stones, area reclaim.
WeB------------------ Wea	Good----------------	Probable------------	Probable------------	Fair: small stones.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WfG*:				
Weikert	Poor: slope, depth to rock.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, area reclaim.
Rock outcrop.				
WkA Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
XgB2*:				
Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Birkbeck	Good	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 "slight," "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
AfA: Alford	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Bc: Beckville	Severe: seepage.	Severe: piping, wetness.	Slight	Flooding, frost action.	Wetness	Favorable.
Be: Belleville	Severe: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding, soil blowing.	Wetness, droughty.
BoA: Bowes Variant	Severe: seepage.	Moderate: thin layer, piping, wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Erodes easily.
BpC3: Boyer	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
BrA: Brenton	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action	Wetness	Wetness.
BxA: Brenton Variant	Moderate: seepage.	Severe: thin layer, wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
CbA: Camden	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
CbB: Camden	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
CbC2: Camden	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
CcF: Casco	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Droughty, slope.
Ce: Ceresco	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, droughty.
Cg: Chagrin	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Favorable	Favorable.
Ck: Cohoctah	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, soil blowing.	Wetness.
CwA: Crosby	Slight	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.

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
CyB2*:						
Crosby	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
Cz: Cyclone	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
Du: Drummer	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Wetness.
FdA: Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
FdB: Fincastle	Moderate: seepage, slope.	Severe: wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
FgB2*:						
Fincastle	Moderate: seepage, slope.	Severe: wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
Miami	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
HeF: Hennepin	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
HxF*:						
Hennepin	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
Rock outcrop.						
JaB: Jasper	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Lb: Landes Variant	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
Lo: Lobdell	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Frost action	Erodes easily, wetness.	Erodes easily.
Mb: Mahalasville	Severe: seepage.	Severe: thin layer, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Wetness.
Mc: Mahalasville	Severe: seepage.	Severe: ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Wetness.

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
MdD2*:						
Martinsville-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ockley-----------	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
MeB*:						
Martinsville-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Ockley-----------	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MeC*:						
Martinsville-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ockley-----------	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
MoC2, MoE2, MpC3, MpD3------------ Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
MrC2*:						
Miami------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
Xenia------------	Severe: slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily.
Ms--------------- Milford	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Mt--------------- Milford Variant	Slight---------	Severe: piping, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
MuA-------------- Millbrook	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
MvA-------------- Millbrook Variant	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
Mw, My----------- Muskego	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
ObA, OcA--------- Ockley	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OcB-------------- Ockley	Moderate: seepage, slope.	Moderate: thin layer, piping.	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
OcC2: Ockley	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
OfB2: Ockley	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OfC2: Ockley	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
OhB: Ockley	Moderate: seepage, depth to rock.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OnB: Octagon	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
OnC: Octagon	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
OsB: Ormas	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing	Droughty.
Pd: Palms	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
PfB: Parr	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
Ph: Pella	Moderate: seepage.	Severe: piping, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Wetness.
Po*, Pq*. Pits						
PrA: Proctor	Severe: seepage.	Moderate: thin layer, piping, wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Erodes easily.
PrB: Proctor	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Ra: Ragsdale	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Wetness.
ReA: Raub	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
RlA: Reesville	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action	Erodes easily, wetness.	Wetness, 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
RnA*:						
Reesville	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
RoG*:						
Rodman	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty, rooting depth.
Rock outcrop.						
RtA Rush	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
RtB Rush	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
RwA Rush Variant	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Erodes easily.
RxC Russell	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Sa, Sb Saranac	Severe: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, flooding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
SdB Shadeland	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.
Sf Shoals	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
SlA Starks	Moderate: seepage.	Severe: thin layer, wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
SrA*:						
Starks	Moderate: seepage.	Severe: thin layer, wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
Crosby	Slight	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
StB St. Charles	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Su Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy	Favorable.

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
Sv: Stonelick Variant	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
TgA: Toronto	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Wetness.
Ty: Treaty	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, erodes easily.	Wetness, erodes easily.
Ud*. Udorthents						
Wa: Wallkill	Severe: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Wb: Washtenaw	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
WcA: Waupecan	Severe: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
WdA: Waynetown	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
WeB: Wea	Severe: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
WfG*: Weikert	Severe: depth to rock, slope, seepage.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty.
Rock outcrop.						
WkA: Whitaker	Severe: seepage.	Severe: wetness.	Severe: slow refill, cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
XgB2*: Xenia	Moderate: slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
Birkbeck	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Severe: slow refill.	Deep to water	Erodes easily	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	
AfA------------- Alford	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-30	5-15
	9-55	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	80-100	25-35	8-15
	55-60	Silt loam, silt	ML, CL-ML, CL	A-4	0	100	100	90-100	70-100	<25	NP-10
Bc-------------- Beckville	0-11	Loam------------	ML, CL-ML	A-4	0	100	98-100	85-100	60-90	<23	NP-7
	11-28	Sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4, A-2-4	0	98-100	95-100	60-95	25-75	<23	NP-7
	28-60	Sandy loam, loam	ML, CL-ML, SM, SM-SC	A-4, A-2-4	0-1	85-100	80-100	50-95	25-75	<23	NP-7
Be-------------- Belleville	0-11	Loamy sand-------	SM	A-2	0	100	95-100	70-85	20-35	<20	NP-4
	11-30	Sand, loamy sand, loamy fine sand.	SM	A-2	0-3	95-100	90-100	50-85	15-30	<20	NP-4
	30-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0-3	95-100	90-100	90-100	70-90	25-50	10-25
BoA------------- Bowes Variant	0-9	Silt loam--------	CL-ML, CL	A-4	0	100	100	90-100	70-90	18-30	4-10
	9-29	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	30-40	11-16
	29-60	Gravelly sandy clay loam, sandy loam, clay loam.	CL, SC, GC	A-2, A-4, A-6	0-3	65-85	55-85	35-80	15-65	25-40	8-20
	60-66	Gravelly coarse sand.	GP, GP-GM, SP, SP-SM	A-1, A-3, A-2	1-5	50-85	50-80	25-55	2-15	---	NP
BpC3------------ Boyer	0-6	Gravelly sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0-5	85-100	70-95	50-90	25-65	<25	NP-7
	6-26	Sandy loam, loam, gravelly coarse sandy loam.	SM, SC, SM-SC, SP-SM	A-2, A-4, A-6	0-5	80-100	65-95	55-85	10-45	10-35	NP-16
	26-60	Gravelly sand, coarse sand, gravel.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-100	30-70	0-10	---	NP
BrA------------- Brenton	0-12	Silt loam--------	CL, ML	A-6, A-4	0	100	95-100	95-100	85-100	30-40	8-15
	12-34	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	95-100	95-100	85-100	35-50	10-25
	34-58	Clay loam, loam, silt loam.	CL	A-6, A-7	0	100	95-100	90-100	75-95	30-45	10-20
	58-65	Stratified loamy sand to silty clay loam.	CL-ML, CL, SM-SC, SC	A-2, A-4, A-6	0	95-100	85-100	80-100	30-85	20-35	5-20
BxA------------- Brenton Variant	0-11	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	15-30	4-15
	11-40	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	85-95	25-40	8-16
	40-47	Silt loam, loam	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-90	20-35	5-15
	47-59	Gravelly loam, gravelly fine sandy loam.	CL-ML, CL, SM-SC, SC	A-4, A-6, A-2	0-3	70-90	65-85	45-80	25-65	15-35	4-15
	59-65	Gravelly loamy coarse sand, gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2	1-5	45-80	30-75	20-55	3-10	---	NP

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
CbA, CbB, CbC2--- Camden	0-10	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-35	3-15
	10-32	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	15-25
	32-74	Clay loam, fine sandy loam, silt loam.	ML, SC, SM, CL	A-2, A-4, A-6	0-5	90-100	85-100	60-90	30-70	20-40	3-15
	74-80	Stratified sandy loam to silt loam.	SM, SC, ML, CL	A-2, A-4	0-5	90-100	80-100	50-80	20-60	<25	3-10
CcF--------------- Casco	0-4	Loam-------------	ML, CL-ML, CL	A-4	0	95-100	85-100	75-100	55-90	20-30	3-10
	4-18	Clay loam, sandy clay loam, gravelly loam.	SC, CL, GC	A-6, A-7, A-2	0-5	60-100	55-100	45-100	20-80	25-46	11-26
	18-60	Stratified sand to gravel.	GP, SP, GP-GM, SP-SM	A-1, A-3, A-2	0-10	30-100	30-100	10-95	2-10	---	NP
Ce---------------- Ceresco	0-27	Loam-------------	SM, ML, SM-SC, CL-ML	A-2, A-4	0	100	100	60-90	30-75	10-20	NP-6
	27-44	Sandy loam, fine sandy loam, loamy fine sand.	SM, ML, SC, CL	A-2, A-4	0	100	95-100	60-85	15-60	15-30	NP-8
	44-60	Gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2	0-10	40-90	35-85	30-60	0-10	---	NP
Cg---------------- Chagrin	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	9-48	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
	48-60	Stratified silt loam to fine sand.	ML, SM	A-4, A-2	0	85-100	75-100	50-85	15-80	20-40	NP-10
Ck---------------- Cohoctah	0-16	Loam-------------	ML, SM	A-4, A-2	0	100	95-100	65-95	30-75	<30	NP-6
	16-50	Loam, fine sandy loam, sandy loam.	ML, SM, SC, CL	A-4, A-2	0	95-100	80-100	70-90	30-70	<30	NP-10
	50-60	Loam, sandy loam, loamy sand.	ML, SM, SC, CL	A-4, A-2	0	95-100	80-100	65-90	20-70	<30	NP-10
CwA--------------- Crosby	0-9	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	50-90	15-30	4-15
	9-33	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0-3	90-100	85-100	75-95	65-95	35-50	15-25
	33-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	85-100	80-95	75-90	50-65	15-30	4-15
CyB2*:											
Crosby-----------	0-10	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	50-90	15-30	4-15
	10-33	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0-3	90-100	85-100	75-95	65-95	35-50	15-25
	33-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	85-100	80-95	75-90	50-65	15-30	4-15

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	
CyB2*:											
Miami-----------	0-9	Silt loam--------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	9-30	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	30-60	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
Cz-------------- Cyclone	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	12-25
	13-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	15-30
	48-61	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-95	50-80	25-40	4-15
	61-70	Loam, fine sandy loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	50-75	20-30	6-15
Du-------------- Drummer	0-15	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	15-49	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	49-57	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	57-65	Stratified sandy loam to silty clay loam.	SC, CL	A-4, A-6	0-5	95-100	85-95	75-95	45-80	20-35	7-20
FdA, FdB--------- Fincastle	0-15	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	15-33	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	33-56	Clay loam, loam, silty clay loam.	CL	A-6	0	95-100	90-100	85-95	75-85	30-40	10-15
	56-60	Loam-------------	CL	A-4, A-6	0-3	88-100	82-100	70-86	50-66	25-30	8-11
FgB2*:											
Fincastle-------	0-10	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	10-30	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	30-49	Clay loam, loam, silty clay loam.	CL	A-6	0	95-100	90-100	85-95	75-85	30-40	10-15
	49-60	Loam-------------	CL	A-4, A-6	0-3	88-100	82-100	70-86	50-66	25-30	8-11
Miami-----------	0-9	Silt loam--------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	9-36	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	36-60	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
HeF------------- Hennepin	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	3-17	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
	17-60	Loam, sandy loam	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-35	5-15
HxF*:											
Hennepin--------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	3-17	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
	17-60	Loam, sandy loam	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-35	5-15
Rock outcrop.											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

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	
JaB------------- Jasper	0-10	Silt loam--------	CL, CL-ML, ML	A-4	0	100	100	90-100	80-90	15-30	2-10
	10-13	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	85-100	65-95	25-40	8-15
	13-58	Loam, sandy loam, sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-2-4, A-2-6, A-6	0-2	95-100	85-100	50-95	25-75	15-30	4-12
	58-65	Fine sandy loam, loam.	CL-ML, ML, SM, SM-SC	A-4	0-2	95-100	85-100	60-95	35-70	<25	4-7
Lb-------------- Landes Variant	0-13	Fine sandy loam	SM, ML	A-4	0	98-100	95-100	70-85	40-55	<20	NP
	13-42	Loamy fine sand	SM	A-2-4	0	98-100	95-100	65-80	20-35	---	NP
	42-60	Sand------------	SM, SP-SM	A-2-4, A-3	0-3	95-100	90-100	50-70	5-15	---	NP
Lo-------------- Lobdell	0-16	Silt loam--------	ML, CL-ML, CL	A-4	0	95-100	90-100	80-100	65-90	20-30	NP-8
	16-50	Loam, silt loam	ML	A-4	0	90-100	80-100	70-95	55-85	20-35	NP-10
	50-60	Stratified sandy loam to silt loam.	ML, SM, CL-ML, CL	A-4	0	90-100	80-100	65-85	40-80	15-35	NP-10
Mb-------------- Mahalasville	0-15	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	15-33	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	33-52	Loam, silt loam	ML, CL-ML, CL	A-6, A-4	0	95-100	90-95	85-95	60-75	22-35	3-15
	52-60	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
Mc-------------- Mahalasville	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-95	30-45	10-20
	11-37	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-45	10-20
	37-57	Loam, silt loam, gravelly loam.	CL, CL-ML	A-4, A-6	0-2	95-100	75-100	70-90	50-75	<30	4-12
	57-65	Gravelly coarse sand, gravelly loamy sand.	GP, GM, SP, SM	A-1	1-5	45-80	30-55	15-40	3-16	---	NP
MdD2*:											
Martinsville----	0-10	Loam------------	CL-ML, CL	A-4, A-6	0	100	90-100	75-100	55-90	<30	4-11
	10-27	Silty clay loam, clay loam, loam.	CL	A-4, A-6	0	100	90-100	75-100	55-90	25-40	9-20
	27-56	Sandy clay loam, sandy loam, loam.	SM-SC, SC, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	85-100	50-95	30-65	20-35	5-15
	56-65	Loam, sandy loam	CL-ML, ML, SM, SM-SC	A-4	0-3	90-100	85-95	50-85	40-70	<25	3-7
Ockley----------	0-10	Loam------------	CL-ML, CL	A-4, A-6	0	100	90-100	80-100	60-90	20-30	4-11
	10-15	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	90-100	80-100	60-95	35-45	15-20
	15-52	Sandy clay loam, sandy loam.	SC	A-4, A-6, A-2-6, A-2-4	0	95-100	80-95	55-85	25-50	25-40	7-16
	52-59	Gravelly sandy clay loam.	SC, GC	A-4, A-6, A-2-6, A-2-4	0-3	65-85	60-75	50-70	20-40	25-35	7-15
	59-65	Sandy loam, loam	ML, CL-ML, SM, SM-SC	A-4, A-2-4	0-5	90-100	80-95	55-85	30-70	<25	3-7

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	
MeB*, MeC*:											
Martinsville	0-10	Silt loam	CL-ML, CL	A-4, A-6	0	100	90-100	75-100	55-90	<30	4-11
	10-27	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6	0	100	90-100	75-100	55-90	25-40	9-20
	27-56	Sandy clay loam, coarse sandy loam, loam.	SM-SC, SC, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	85-100	50-95	30-65	20-35	5-15
	56-65	Loam, fine sandy loam.	CL-ML, ML, SM, SM-SC	A-4	0-3	90-100	85-95	50-85	40-70	<25	3-7
Ockley	0-10	Silt loam	CL-ML, CL	A-4, A-6	0	100	90-100	80-100	60-90	20-30	4-11
	10-15	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	90-100	80-100	60-95	35-45	15-20
	15-52	Sandy clay loam, sandy loam.	SC	A-4, A-6, A-2-6, A-2-4	0	95-100	80-95	55-85	25-50	25-40	7-16
	52-59	Gravelly sandy clay loam.	SC, GC	A-4, A-6, A-2-6, A-2-4	0-3	65-85	60-75	50-70	20-40	25-35	7-15
	59-65	Sandy loam, loam	ML, CL-ML, SM, SM-SC	A-4, A-2-4	0-5	90-100	80-95	55-85	30-70	<25	3-7
MoC2, MoE2 Miami	0-9	Silt loam	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	9-36	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	36-60	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
MpC3, MpD3 Miami	0-9	Clay loam	CL	A-6	0	100	90-100	75-95	65-95	30-40	15-20
	9-36	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	36-60	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
MrC2*:											
Miami	0-9	Silt loam	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	9-36	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	36-60	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
Xenia	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	9-27	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	27-45	Clay loam	CL	A-6, A-7	0-5	92-100	90-95	75-95	65-75	35-50	15-30
	45-60	Loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	75-90	40-65	15-30	NP-15
Ms Milford	0-15	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	15-49	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	49-60	Stratified clay to sandy loam.	CL, SC	A-6, A-7	0	97-100	95-100	90-100	45-100	25-50	10-30
Mt Milford Variant	0-17	Mucky silty clay	CL, CH	A-7	0	100	100	95-100	90-95	40-55	15-25
	17-26	Silty clay	CH, CL	A-7	0	100	100	95-100	90-95	40-55	15-25
	26-60	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

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	
MuA: Millbrook	0-8	Silt loam	CL, CL-ML	A-6, A-4	0	100	100	95-100	85-100	20-35	5-15
	8-34	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	85-100	30-45	10-25
	34-40	Clay loam, loam, sandy loam.	SC, CL	A-6, A-7	0-5	95-100	90-100	70-90	40-80	25-50	10-25
	40-60	Stratified loamy sand to clay loam.	SM, SC, CL, ML	A-4, A-6, A-2	0-5	95-100	90-100	70-95	30-80	<30	NP-15
MvA: Millbrook Variant	0-9	Silt loam	CL, CL-ML	A-4	0	100	100	90-100	70-90	<30	4-9
	9-28	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-98	70-90	30-40	11-16
	28-40	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6, A-2-4, A-2-6	0	95-100	85-95	65-95	30-70	25-40	9-18
	40-58	Gravelly sandy clay loam, gravelly coarse sandy loam, gravelly clay loam.	SC, SM-SC, CL, CL-ML	A-2-4, A-2-6, A-4, A-6	0-3	75-85	65-80	40-75	20-60	<35	4-12
	58-65	Gravelly loamy sand, gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	1-5	45-80	45-75	25-55	4-20	---	NP
Mw, My: Muskego	0-26	Sapric material	PT	A-8	0	---	---	---	---	---	---
	26-60	Coprogenous earth	OL	A-5	0	95-100	95-100	85-100	75-96	40-50	2-8
ObA: Ockley	0-10	Loam	CL, ML, CL-ML	A-4	0	95-100	85-100	70-100	50-90	15-30	3-10
	10-17	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
	17-63	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
	63-70	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	50-80	50-80	10-55	2-10	---	NP
OcA, OcB, OcC2: Ockley	0-10	Silt loam	CL, ML, CL-ML	A-4	0	95-100	85-100	70-100	50-90	15-30	3-10
	10-33	Silty clay loam, clay loam, loam.	CL	A-6, A-4	0	90-100	80-100	70-90	55-90	25-40	8-15
	33-58	Gravelly sandy 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
	58-65	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	50-80	50-80	10-55	2-10	---	NP
OfB2, OfC2: Ockley	0-7	Silt loam	CL, ML, CL-ML	A-4	0	95-100	85-100	70-100	50-90	15-30	3-10
	7-53	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
	53-58	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
	58-70	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	50-80	50-80	10-55	2-10	---	NP

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	
OhB----------- Ockley	0-10	Loam------------	CL, CL-ML	A-4	0	98-100	80-100	70-100	50-90	<30	4-9
	10-18	Loam, clay loam	CL	A-4, A-6	0	98-100	80-95	70-90	50-85	25-35	9-14
	18-48	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-2-6	0	50-90	45-85	35-80	20-65	30-40	10-15
	48-53	Silt loam, silty clay loam.	CL	A-4, A-6	0-3	98-100	80-100	70-100	50-90	25-40	8-15
	53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
OnB, OnC--------- Octagon	0-8	Loam------------	CL, CL-ML, ML	A-4	0	100	95-100	80-95	55-75	<25	3-8
	8-24	Clay loam, loam	CL	A-4, A-6	0	95-100	90-100	70-100	55-95	25-35	9-15
	24-30	Loam------------	CL, CL-ML, ML	A-4	0	95-100	90-100	70-100	55-95	<25	4-8
	30-60	Fine sandy loam	ML, CL-ML	A-4	0-3	85-95	85-95	65-95	50-65	<25	3-6
OsB----------- Ormas	0-9	Loamy sand-------	SM	A-2-4	0	98-100	95-100	50-75	15-30	---	NP
	9-27	Sand, fine sand, loamy sand.	SW-SM, SM, SP-SM	A-2-4, A-1-b	0	95-100	90-100	45-70	10-20	---	NP
	27-38	Sandy loam, fine sandy loam.	SM-SC, SM	A-2-4, A-4	0	90-100	85-100	50-70	25-40	<15	NP-5
	38-51	Gravelly sandy clay loam, gravelly coarse sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2-4, A-2-6	0	60-80	55-80	35-70	20-45	20-40	6-20
	51-60	Gravelly sand, very gravelly coarse sand, gravelly coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	60-80	55-80	30-55	3-12	---	NP
Pd------------- Palms	0-17	Sapric material	PT	---	---	---	---	---	---	---	---
	17-60	Clay loam, silt loam, fine sandy loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
PfB------------ Parr	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	95-100	80-100	50-90	15-30	4-15
	11-34	Clay loam, loam, silty clay loam.	CL	A-6, A-4	0	90-100	90-100	75-100	50-80	25-35	9-15
	34-60	Fine sandy loam, loam.	CL, ML, CL-ML	A-4	0-3	85-95	85-95	75-85	50-65	<25	3-8
Ph------------- Pella	0-11	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-95	40-50	15-25
	11-34	Silty clay loam, silty clay, clay loam.	CL	A-6, A-7	0	100	95-100	90-100	85-95	30-50	15-30
	34-60	Stratified silty clay loam to sandy loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-90	25-45	10-25
Po*, Pq*. Pits											
PrA------------ Proctor	0-17	Silt loam--------	CL	A-6	0	100	100	95-100	85-100	25-40	10-22
	17-39	Silty clay loam, clay loam.	CL	A-7, A-6	0	95-100	90-100	85-100	65-90	25-50	10-25
	39-65	Stratified sandy clay loam to sand.	SC, CL, SM-SC, CL-ML	A-2, A-4, A-6	0	85-100	80-100	50-100	25-80	20-40	5-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

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	
PrB-------------- Proctor	0-13	Silt loam--------	CL	A-6	0	100	100	95-100	85-100	25-40	10-22
	13-29	Silty clay loam, clay loam.	CL	A-7, A-6	0	95-100	90-100	85-100	65-90	25-50	10-25
	29-60	Stratified loam to sand.	SC, CL, SM-SC, CL-ML	A-2, A-4, A-6	0	85-100	80-100	50-100	25-80	20-40	5-20
Ra--------------- Ragsdale	0-10	Silty clay loam	CL	A-6	0	100	100	90-100	80-100	30-35	10-15
	10-37	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	80-95	25-35	8-13
	37-60	Silt loam--------	CL-ML, ML, CL	A-4	0	100	100	90-100	70-90	<25	3-8
ReA-------------- Raub	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-35	5-15
	13-37	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	20-35
	37-70	Loam, clay loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-95	70-85	40-65	15-30	NP-15
RlA-------------- Reesville	0-9	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	25-35	4-10
	9-34	Silty clay loam	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	20-50	4-28
	34-45	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	80-90	20-40	4-20
	45-60	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	80-90	70-90	20-40	3-18
RnA*:											
Reesville-------	0-10	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	25-35	4-10
	10-50	Silty clay loam	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	20-50	4-28
	50-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	80-90	20-40	4-20
Fincastle-------	0-9	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	9-28	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	28-41	Clay loam, loam, silty clay loam.	CL	A-6	0	95-100	90-98	85-95	75-85	30-40	10-15
	41-60	Loam-------------	CL	A-4, A-6	0-3	88-96	82-90	70-86	50-66	25-30	8-11
RoG*:											
Rodman----------	0-5	Gravelly loam----	ML, CL, SM, SC	A-4	0-2	70-85	65-85	60-80	36-65	<30	3-9
	5-10	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
	10-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	22-50	7-20	2-10	---	NP
Rock outcrop.											
RtA, RtB--------- Rush	0-10	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	80-95	29-38	7-15
	10-34	Silty clay loam, silt loam.	CL	A-7	0	100	100	95-100	85-95	40-50	21-26
	34-62	Clay loam, gravelly sandy loam, gravelly loam.	CL, SC	A-6, A-7, A-2	1-5	75-90	60-85	50-80	30-60	30-45	15-22
	62-70	Stratified sand to gravelly sand.	SP, SP-SM, GP-GM, GP	A-1	1-5	30-70	22-55	7-20	2-10	<30	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
RwA---------- Rush Variant	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-95	<26	4-12
	9-28	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	28-40	Clay loam--------	CL	A-6	0	90-100	85-95	70-90	50-75	30-40	10-20
	40-59	Gravelly sandy clay loam.	SC, GC, CL-ML, CL	A-6, A-4, A-2	0-3	65-85	65-80	40-70	25-70	20-35	5-15
	59-65	Gravelly loamy sand.	SP, SM, GP, GM	A-1, A-3, A-2	1-5	45-80	45-75	20-55	3-20	---	NP
RxC---------- Russell	0-11	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	90-100	70-90	<25	3-8
	11-34	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	34-63	Clay loam, loam	CL	A-6	0	95-100	90-95	80-95	60-80	30-35	10-15
	63-70	Loam-------------	CL-ML, CL	A-4	0-3	85-95	80-90	65-90	50-75	<25	4-8
Sa, Sb---------- Saranac	0-14	Silty clay loam	CL	A-6	0	100	100	90-100	70-95	30-40	10-15
	14-49	Silty clay loam, silty clay, clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-20
	49-60	Gravelly coarse sandy loam.	GP, GM, SP, SM	A-4, A-1, A-2, A-3	0	45-85	45-80	20-70	2-50	---	NP
SdB---------- Shadeland	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	90-100	70-100	60-100	50-90	25-35	5-15
	11-26	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0-5	90-100	70-100	65-100	55-95	35-50	20-30
	26-35	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0-5	90-100	70-100	60-100	50-80	35-45	15-25
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sf------------ Shoals	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	20-35	6-15
	8-60	Silt loam, loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	5-15
SlA----------- Starks	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	22-35	5-15
	10-36	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-45	15-24
	36-58	Loam, silty clay loam, sandy loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	95-100	90-100	80-95	40-80	25-40	6-17
	58-65	Stratified loamy sand to silt loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-5	90-100	80-95	40-90	30-60	<30	NP-15
SrA*:											
Starks----------	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	22-35	5-15
	11-36	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-45	15-24
	36-49	Loam, clay loam, sandy loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	95-100	90-100	80-95	40-80	25-40	6-17
	49-60	Stratified loamy sand to silt loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-5	90-100	80-100	40-90	30-60	<30	NP-15
Crosby----------	0-10	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	50-90	15-30	4-15
	10-26	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0-3	90-100	85-100	75-95	65-95	35-50	15-25
	26-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	85-100	80-95	75-90	50-65	15-30	4-15

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	
StB--------------- St. Charles	0-9	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	95-100	22-35	7-15
	9-49	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	90-100	30-40	10-20
	49-70	Stratified silt loam to sandy loam.	CL-ML, CL, SM-SC, SC	A-2, A-4, A-6	0-5	90-100	80-90	60-90	30-70	15-35	5-15
Su--------------- Stonelick	0-17	Silt loam--------	ML, CL, SM, CL-ML	A-4	0	85-100	70-100	60-95	45-90	20-32	2-10
	17-60	Stratified loam to loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1-b	0	85-100	70-100	40-60	5-40	<15	NP
Sv--------------- Stonelick Variant	0-9	Fine sandy loam	SM, ML	A-4	0	98-100	90-100	65-85	35-55	---	NP
	9-41	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-1, A-3, A-2	0	98-100	90-100	45-75	5-35	---	NP
	41-60	Stratified very gravelly coarse sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	1-5	45-80	40-80	20-55	2-12	---	NP
TgA--------------- Toronto	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	9-37	Silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	37-54	Loam-------------	CL	A-6, A-7	0	95-100	90-95	85-95	65-75	35-50	15-25
	54-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	15-30	5-15
Ty--------------- Treaty	0-14	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	14-36	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	36-59	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
	59-70	Loam, silt loam	CL-ML, CL	A-4, A-6	0	90-100	90-95	75-90	55-75	20-30	5-15
Ud*. Udorthents											
Wa--------------- Wallkill	0-8	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	95-100	90-100	75-100	60-85	16-32	3-12
	8-20	Silt loam, loam	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-100	60-85	20-34	6-13
	20-60	Sapric material, hemic material.	PT, OH	A-8	0	---	---	---	---	---	---
Wb--------------- Washtenaw	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
	8-25	Silt loam, loam	CL, ML	A-6, A-4	0	100	100	90-100	70-90	27-36	4-12
	25-54	Silty clay loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	36-50	15-28
	54-60	Silt loam--------	CL	A-4, A-6	0-3	90-100	85-95	80-95	60-75	22-33	8-15
WcA--------------- Waupecan	0-11	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	85-95	20-35	8-15
	11-35	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	35-72	Stratified sandy clay loam to gravelly loamy sand.	SM, SC, ML, CL	A-2, A-4	0	90-100	65-90	50-70	25-65	<20	NP-10
	72-80	Sand and gravel, very gravelly sandy loam.	GP, SP, SP-SM, GP-GM	A-1	10-35	40-95	30-85	30-50	0-15	---	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	
WdA-------------- Waynetown	0-14	Silt loam--------	CL-ML, CL, ML	A-4	0	100	95-100	85-100	70-90	<25	3-8
	14-32	Silty clay loam	CL	A-6	0	100	95-100	90-100	80-95	30-40	10-16
	32-45	Loam, clay loam	CL	A-6, A-4	0	90-100	90-100	75-100	50-80	25-35	8-14
	45-70	Gravelly sandy clay loam, gravelly sandy loam, gravelly clay loam.	CL, SC, GC	A-4, A-6, A-2-4, A-2-6	0-3	60-85	55-80	45-75	20-55	25-35	8-15
	70-75	Gravelly coarse sand, gravelly loamy coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	45-80	45-70	20-50	3-11	---	NP
WeB-------------- Wea	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	10-27	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	95-100	90-95	85-95	65-90	35-50	15-30
	27-54	Gravelly loam, gravelly sandy loam.	CL, SM-SC, SC, CL-ML	A-4, A-6	0-5	70-85	65-85	60-80	35-65	15-30	5-15
	54-60	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	0-10	---	NP
WfG*:											
Weikert----------	0-15	Channery loam----	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
WkA-------------- Whitaker	0-10	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	<30	4-10
	10-18	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	18-52	Clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	95-100	75-100	35-80	25-40	9-20
	52-56	Stratified silt loam to loamy sand.	ML, CL-ML, SM, SM-SC	A-2-4, A-4	0	100	95-100	50-100	15-85	<20	NP-4
	56-60	Sandy loam, loam	ML, CL-ML, SM, SM-SC	A-2-4, A-4	0-3	95-100	90-100	55-90	30-70	<20	NP-6
XgB2*:											
Xenia------------	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	9-27	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	27-45	Clay loam--------	CL	A-6, A-7	0-5	92-100	90-100	75-95	65-75	35-50	15-30
	45-60	Loam-------------	CL, ML, SC, SM	A-4, A-6	0-5	85-100	80-100	75-90	40-65	15-30	NP-15
Birkbeck---------	0-10	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	95-100	28-40	5-15
	10-55	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	95-100	95-100	85-100	30-50	10-25
	55-66	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	95-100	80-90	75-90	45-70	15-30	5-15

* 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		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
AfA--------------	0-9	12-26	1.25-1.40	0.6-2.0	0.22-0.24	3.6-7.3	Low----------	0.37	5	5	.5-2
Alford	9-55	22-30	1.35-1.50	0.6-2.0	0.18-0.20	3.6-6.0	Moderate-----	0.37			
	55-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37			
Bc---------------	0-11	7-18	1.30-1.50	0.6-2.0	0.20-0.24	6.6-7.8	Low----------	0.32	5	5	1-3
Beckville	11-28	7-18	1.30-1.50	2.0-6.0	0.13-0.19	6.6-7.8	Low----------	0.32			
	28-60	7-18	1.30-1.60	2.0-6.0	0.11-0.18	7.4-8.4	Low----------	0.32			
Be---------------	0-11	3-12	0.90-1.60	6.0-20	0.10-0.12	6.1-7.8	Low----------	0.17	5	2	.5-3
Belleville	11-30	2-12	1.45-1.70	6.0-20	0.06-0.10	6.1-8.4	Low----------	0.17			
	30-60	25-35	1.45-1.95	0.2-0.6	0.14-0.20	6.1-7.8	Moderate-----	0.32			
BoA--------------	0-9	12-23	1.30-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	5	2-4
Bowes Variant	9-29	25-35	1.40-1.55	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.43			
	29-60	18-30	1.45-1.60	0.6-6.0	0.10-0.14	4.5-6.5	Moderate-----	0.24			
	60-66	1-5	1.50-1.70	6.0-20	0.02-0.04	7.4-8.4	Low----------	0.10			
BpC3-------------	0-6	5-15	1.15-1.60	2.0-6.0	0.11-0.13	5.6-7.3	Low----------	0.24	3	3	.5-3
Boyer	6-26	10-18	1.25-1.60	2.0-6.0	0.11-0.13	5.6-7.8	Low----------	0.24			
	26-60	0-10	1.20-1.70	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
BrA--------------	0-12	20-27	1.25-1.50	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.28	5	6	2-4
Brenton	12-34	25-35	1.30-1.55	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
	34-58	20-30	1.40-1.60	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.28			
	58-65	15-30	1.50-1.70	0.6-2.0	0.11-0.20	6.6-8.4	Low----------	0.28			
BxA--------------	0-11	12-25	1.30-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.28	5	5	2-4
Brenton Variant	11-40	20-35	1.30-1.50	0.6-2.0	0.18-0.22	5.1-7.3	Moderate-----	0.43			
	40-47	15-25	1.30-1.50	0.6-2.0	0.17-0.22	6.1-7.3	Low----------	0.43			
	47-59	10-27	1.60-1.80	0.6-2.0	0.09-0.13	6.1-7.8	Low----------	0.24			
	59-65	1-5	1.65-1.85	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
CbA, CbB, CbC2---	0-10	14-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	1-2
Camden	10-32	22-35	1.35-1.55	0.6-2.0	0.16-0.20	4.1-6.5	Moderate-----	0.37			
	32-74	18-30	1.45-1.65	0.6-2.0	0.11-0.22	4.1-6.5	Low----------	0.37			
	74-80	5-20	1.55-1.75	0.6-6.0	0.11-0.22	5.6-8.4	Low----------	0.37			
CcF--------------	0-4	10-20	1.35-1.55	0.6-2.0	0.19-0.24	5.6-7.3	Low----------	0.32	3	5	1-3
Casco	4-18	18-35	1.55-1.65	0.6-2.0	0.09-0.19	5.6-7.8	Moderate-----	0.32			
	18-60	0-2	1.30-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
Ce---------------	0-27	2-15	1.15-1.60	2.0-6.0	0.13-0.22	6.1-7.8	Low----------	0.20	4	3	2-4
Ceresco	27-44	10-20	1.40-1.70	0.6-6.0	0.08-0.19	6.1-8.4	Low----------	0.20			
	44-60	0-10	1.45-1.65	>20	0.02-0.04	7.9-8.4	Low----------	0.10			
Cg---------------	0-9	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	5	5	1-2
Chagrin	9-48	18-27	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low----------	0.32			
	48-60	5-25	1.20-1.40	0.6-2.0	0.08-0.20	6.1-8.4	Low----------	0.32			
Ck---------------	0-16	7-20	1.20-1.60	2.0-6.0	0.13-0.22	6.1-7.8	Low----------	0.28	5	3	1-4
Cohoctah	16-50	5-27	1.45-1.65	2.0-6.0	0.12-0.20	6.1-8.4	Low----------	0.28			
	50-60	2-25	1.45-1.65	2.0-6.0	0.08-0.20	6.1-8.4	Low----------	0.28			
CwA--------------	0-9	11-24	1.35-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.43	3	5	1-3
Crosby	9-33	35-45	1.50-1.70	0.06-0.2	0.15-0.20	4.5-7.3	Moderate-----	0.43			
	33-60	15-27	1.70-2.00	0.06-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			

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 erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
CyB2*:											
Crosby----------	0-10	11-24	1.35-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.43	3	5	1-3
	10-33	35-45	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.3	Moderate-----	0.43			
	33-60	15-27	1.70-2.00	0.06-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			
Miami-----------	0-9	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
	9-30	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.0	Moderate-----	0.37			
	30-60	15-25	1.55-1.90	0.2-0.6	0.05-0.10	6.6-8.4	Moderate-----	0.37			
Cz--------------- Cyclone	0-13	27-33	1.40-1.60	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.28	5	7	4-6
	13-48	25-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.43			
	48-61	15-25	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.8	Low----------	0.43			
	61-70	15-25	1.50-1.80	0.6-2.0	0.05-0.10	7.4-8.4	Low----------	0.43			
Du--------------- Drummer	0-15	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate-----	0.28	5	7	5-7
	15-49	20-35	1.20-1.45	0.6-2.0	0.21-0.24	5.6-7.8	Moderate-----	0.28			
	49-57	22-33	1.30-1.55	0.6-2.0	0.17-0.20	6.1-8.4	Moderate-----	0.28			
	57-65	15-32	1.40-1.70	0.6-2.0	0.11-0.19	6.6-8.4	Low----------	0.28			
FdA, FdB--------- Fincastle	0-15	11-22	1.40-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	5	5	1-3
	15-33	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	33-56	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	0.05-0.10	7.4-8.4	Low----------	0.37			
FgB2*:											
Fincastle--------	0-10	11-22	1.40-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	5	5	1-3
	10-30	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	30-49	24-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	49-60	20-26	1.55-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Miami-----------	0-9	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
	9-36	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.0	Moderate-----	0.37			
	36-60	15-25	1.55-1.90	0.2-0.6	0.05-0.10	6.6-8.4	Moderate-----	0.37			
HeF-------------- Hennepin	0-3	20-27	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	4	5	1-2
	3-17	18-30	1.30-1.60	0.2-2.0	0.14-0.22	6.1-7.8	Low----------	0.32			
	17-60	18-30	1.45-1.90	0.06-0.6	0.07-0.11	6.1-8.4	Low----------	0.32			
HxF*:											
Hennepin--------	0-3	20-27	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	4	5	1-2
	3-17	18-27	1.30-1.60	0.2-2.0	0.14-0.22	6.1-7.8	Low----------	0.32			
	17-60	18-27	1.45-1.90	0.06-0.6	0.07-0.11	6.1-8.4	Low----------	0.32			
Rock outcrop.											
JaB-------------- Jasper	0-10	10-22	1.30-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.32	5	5	2-4
	10-13	18-32	1.45-1.60	0.6-2.0	0.17-0.22	5.1-6.0	Moderate-----	0.43			
	13-58	12-26	1.45-1.60	0.6-2.0	0.12-0.18	5.1-7.3	Low----------	0.24			
	58-65	9-18	1.65-1.90	0.2-0.6	0.05-0.12	7.4-8.4	Low----------	0.32			
Lb--------------- Landes Variant	0-13	5-10	1.30-1.50	2.0-6.0	0.16-0.18	5.6-6.0	Low----------	0.20	5	3	1-2
	13-42	2-10	1.55-1.70	2.0-6.0	0.09-0.11	6.1-8.4	Low----------	0.20			
	42-60	1-5	1.60-1.75	6.0-20.0	0.05-0.07	7.9-8.4	Low----------	0.20			
Lo--------------- Lobdell	0-16	15-27	1.20-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	5	5	1-3
	16-50	18-27	1.25-1.60	0.6-2.0	0.17-0.22	5.1-7.3	Low----------	0.37			
	50-60	15-27	1.20-1.60	2.0-6.0	0.12-0.18	5.6-7.3	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
Mb---------------- Mahalasville	0-15	27-30	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	7	4-6
	15-33	27-35	1.40-1.60	0.6-2.0	0.18-0.20	6.6-7.3	Moderate-----	0.28			
	33-52	8-25	1.40-1.60	0.6-2.0	0.17-0.19	6.6-7.8	Low----------	0.28			
	52-60	3-18	1.50-1.70	2.0-6.0	0.19-0.21	7.4-8.4	Low----------	0.28			
Mc---------------- Mahalasville	0-11	27-35	1.35-1.55	0.6-2.0	0.22-0.24	6.1-7.3	Moderate-----	0.28	5	7	4-6
	11-37	30-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.28			
	37-57	10-25	1.30-1.45	0.6-2.0	0.15-0.22	6.6-7.8	Low----------	0.28			
	57-65	1-5	1.60-1.80	6.0-20.0	0.02-0.04	7.4-8.4	Low----------	0.10			
MdD2*, MeB*, MeC*:											
Martinsville---	0-10	10-22	1.30-1.40	0.6-2.0	0.20-0.24	5.6-6.5	Low----------	0.37	5	5	1-2
	10-27	22-31	1.40-1.65	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.37			
	27-56	15-28	1.55-1.65	0.6-2.0	0.16-0.19	5.1-7.8	Moderate-----	0.37			
	56-65	8-15	1.65-1.85	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.28			
Ockley----------	0-10	10-20	1.30-1.40	0.6-2.0	0.20-0.24	5.6-6.5	Low----------	0.37	5	5	1-2
	10-15	26-32	1.40-1.65	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.37			
	15-52	15-28	1.55-1.65	0.6-2.0	0.16-0.19	5.1-6.0	Moderate-----	0.37			
	52-59	20-25	1.60-1.70	0.6-2.0	0.12-0.15	6.1-7.8	Moderate-----	0.24			
	59-65	8-15	1.65-1.85	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.24			
MoC2, MoE2-------- Miami	0-9	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
	9-36	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	36-60	15-25	1.55-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
MpC3, MpD3-------- Miami	0-9	27-35	1.35-1.60	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37	3	6	.5-3
	9-36	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	36-60	15-25	1.55-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
MrC2*:											
Miami------------	0-9	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
	9-36	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.0	Moderate-----	0.37			
	36-60	15-25	1.55-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
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
	9-27	27-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.37			
	27-45	27-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	45-60	15-27	1.55-1.90	0.2-2.0	0.05-0.10	7.9-8.4	Low----------	0.37			
Ms---------------- Milford	0-15	35-42	1.30-1.50	0.6-2.0	0.12-0.23	5.6-7.3	High---------	0.28	5	4	5-6
	15-49	35-42	1.40-1.65	0.2-0.6	0.18-0.20	5.6-7.8	Moderate-----	0.43			
	49-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	6.6-8.4	Moderate-----	0.43			
Mt---------------- Milford Variant	0-17	40-50	1.40-1.60	0.06-0.2	0.16-0.18	6.6-7.8	High---------	0.28	5	4	8-12
	17-26	40-50	1.45-1.60	<0.06	0.11-0.13	6.6-8.4	High---------	0.28			
	26-60	15-25	1.40-1.60	<0.06	0.20-0.22	7.4-8.4	Low----------	0.43			
MuA--------------- Millbrook	0-8	18-27	1.40-1.60	0.6-2.0	0.22-0.24	5.1-7.8	Low----------	0.32	5	6	2-4
	8-34	25-42	1.45-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	34-40	18-35	1.45-1.70	0.6-2.0	0.12-0.19	5.1-7.3	Moderate-----	0.32			
	40-60	10-25	1.50-1.75	0.6-2.0	0.11-0.19	5.6-8.4	Low----------	0.32			
MvA--------------- Millbrook Variant	0-9	10-20	1.30-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	5	2-4
	9-28	26-34	1.35-1.60	0.6-2.0	0.18-0.22	4.5-6.0	Moderate-----	0.43			
	28-40	20-33	1.45-1.60	0.6-2.0	0.16-0.18	4.5-6.0	Moderate-----	0.32			
	40-58	10-28	1.60-1.80	0.6-2.0	0.09-0.13	5.1-6.5	Low----------	0.24			
	58-65	1-5	1.65-1.85	6.0-20	0.02-0.04	7.4-8.4	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
Mw, My-----------	0-26	0	0.10-0.21	0.6-6.0	0.35-0.45	5.6-7.3	-------------	----	2	2	>50
Muskego	26-60	18-35	0.30-1.10	0.06-0.2	0.18-0.24	6.6-8.4	Moderate-----	0.28			
ObA--------------	0-10	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
Ockley	10-17	20-35	1.45-1.60	0.6-2.0	0.15-0.22	4.5-7.3	Moderate-----	0.37			
	17-63	20-35	1.40-1.55	0.6-2.0	0.06-0.11	5.1-6.5	Moderate-----	0.24			
	63-70	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
OcA, OcB, OcC2---	0-10	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
Ockley	10-33	20-35	1.45-1.60	0.6-2.0	0.15-0.22	4.5-7.3	Moderate-----	0.37			
	33-58	18-35	1.40-1.55	0.6-2.0	0.06-0.11	5.1-6.5	Moderate-----	0.24			
	58-65	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
OfB2, OfC2-------	0-7	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
Ockley	7-53	20-35	1.45-1.60	0.6-2.0	0.15-0.22	4.5-7.3	Moderate-----	0.37			
	53-58	20-35	1.40-1.55	0.6-2.0	0.06-0.11	5.1-6.5	Moderate-----	0.24			
	58-70	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
OhB--------------	0-10	10-20	1.30-1.40	0.6-2.0	0.20-0.24	6.6-7.3	Low----------	0.37	5	5	1-2
Ockley	10-18	20-30	1.45-1.60	0.6-2.0	0.15-0.19	6.6-7.3	Moderate-----	0.37			
	18-48	24-33	1.60-1.70	0.6-2.0	0.14-0.18	5.6-6.5	Moderate-----	0.28			
	48-53	20-30	1.55-1.65	0.6-2.0	0.17-0.21	5.1-5.5	Low----------	0.43			
	53	---	---	---	---	---	-------------	----			
OnB, OnC---------	0-8	10-20	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5	5	1-4
Octagon	8-24	22-30	1.35-1.50	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.28			
	24-30	12-20	1.40-1.60	0.6-2.0	0.15-0.19	6.6-8.4	Low----------	0.28			
	30-60	9-15	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
OsB--------------	0-9	5-12	1.40-1.60	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	1-3
Ormas	9-27	3-10	1.45-1.60	6.0-20	0.07-0.09	5.6-7.3	Low----------	0.17			
	27-38	10-20	1.50-1.70	2.0-6.0	0.12-0.14	5.1-7.3	Low----------	0.17			
	38-51	18-25	1.50-1.60	2.0-6.0	0.11-0.14	5.6-7.8	Low----------	0.32			
	51-60	1-8	1.55-1.70	>20	0.03-0.05	7.4-8.4	Low----------	0.15			
Pd---------------	0-17	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-7.8	-------------	----	2	3	>75
Palms	17-60	7-35	1.45-1.75	0.2-2.0	0.14-0.22	6.1-8.4	Low----------	----			
PfB--------------	0-11	12-22	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.28	5	5	2-4
Parr	11-34	22-32	1.40-1.55	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.28			
	34-60	10-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Ph---------------	0-11	27-35	1.10-1.30	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28	5	7	5-6
Pella	11-34	27-42	1.20-1.45	0.6-2.0	0.21-0.24	6.6-7.8	Moderate-----	0.28			
	34-60	15-30	1.35-1.60	0.6-2.0	0.15-0.20	7.4-8.4	Moderate-----	0.28			
Po*, Pq*.											
Pits											
PrA--------------	0-17	18-25	1.10-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	6	2-4
Proctor	17-39	27-35	1.20-1.45	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.43			
	39-65	10-32	1.40-1.70	0.6-6.0	0.07-0.19	6.1-7.8	Low----------	0.43			
PrB--------------	0-13	18-25	1.10-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5-4	6	2-4
Proctor	13-29	27-35	1.20-1.45	0.6-2.0	0.15-0.20	5.6-6.5	Moderate-----	0.43			
	29-60	10-32	1.40-1.70	0.6-6.0	0.07-0.19	6.1-7.3	Low----------	0.43			
Ra---------------	0-10	28-30	1.40-1.60	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	7	3-6
Ragsdale	10-37	20-30	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.28			
	37-60	10-20	1.50-1.70	0.6-2.0	0.20-0.22	7.4-8.4	Low----------	0.28			

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
ReA-------------- Raub	0-13	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.28	5	5	2-4
	13-37	27-35	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	37-70	20-32	1.50-1.70	0.2-0.6	0.05-0.10	6.6-8.4	Low-----------	0.37			
RlA-------------- Reesville	0-9	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.1-7.3	Low-----------	0.37	5	5	1-2
	9-34	27-35	1.30-1.55	0.6-2.0	0.17-0.22	4.5-7.8	Moderate-----	0.37			
	34-45	20-25	1.30-1.60	0.6-2.0	0.15-0.20	7.4-8.4	Low-----------	0.37			
	45-60	12-25	1.30-1.70	0.2-0.6	0.15-0.18	7.4-8.4	Low-----------	0.37			
RnA*:											
Reesville--------	0-10	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.1-7.3	Low-----------	0.37	5	5	1-2
	10-50	27-35	1.30-1.55	0.6-2.0	0.17-0.22	5.1-7.8	Moderate-----	0.37			
	50-60	15-25	1.30-1.60	0.2-0.6	0.15-0.20	7.4-8.4	Low-----------	0.37			
Fincastle--------	0-9	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
	9-28	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	28-41	24-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	41-60	20-26	1.55-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			
RoG*:											
Rodman-----------	0-5	8-25	1.20-1.50	2.0-6.0	0.10-0.12	6.6-7.8	Low-----------	0.20	3	8	2-4
	5-10	5-25	1.10-1.50	2.0-6.0	0.09-0.12	6.6-7.8	Low-----------	0.20			
	10-60	0-10	1.80-2.00	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
Rock outcrop.											
RtA, RtB--------- Rush	0-10	10-20	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	5	.5-2
	10-34	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	34-62	20-30	1.40-1.55	0.6-2.0	0.15-0.19	4.5-7.8	Moderate-----	0.37			
	62-70	2-6	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
RwA-------------- Rush Variant	0-9	10-18	1.30-1.55	0.6-2.0	0.22-0.24	5.1-6.5	Low-----------	0.37	5	5	.5-2
	9-28	27-33	1.35-1.50	0.6-2.0	0.18-0.20	5.6-6.0	Moderate-----	0.37			
	28-40	27-34	1.40-1.55	0.6-2.0	0.12-0.19	5.6-6.0	Moderate-----	0.37			
	40-59	20-30	1.40-1.55	0.6-2.0	0.10-0.15	6.1-6.5	Moderate-----	0.24			
	59-65	1-5	1.60-1.80	6.0-20	0.02-0.04	7.9-8.4	Low-----------	0.10			
RxC-------------- Russell	0-11	10-20	1.30-1.45	0.6-20	0.22-0.24	5.1-6.5	Low-----------	0.37	5	5	.5-2
	11-34	25-35	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	34-63	25-32	1.40-1.60	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.37			
	63-70	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			
Sa, Sb----------- Saranac	0-14	27-33	1.40-1.50	0.2-0.6	0.21-0.24	6.1-7.8	Moderate-----	0.28	5	6	4-8
	14-49	27-41	1.50-1.60	0.2-0.6	0.11-0.20	6.6-7.3	Moderate-----	0.43			
	49-60	3-10	1.70-1.80	2.0-6.0	0.02-0.11	7.4-7.8	Low-----------	0.10			
SdB-------------- Shadeland	0-11	18-27	1.50-1.70	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.37	4	5	1-3
	11-26	20-35	1.50-1.70	0.2-0.6	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	26-35	20-35	1.50-1.70	0.2-0.6	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	35	---	---	---	---	---	-------------	----			
Sf--------------- Shoals	0-8	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	Low-----------	0.37	5	5	1-2
	8-60	18-33	1.35-1.55	0.6-2.0	0.17-0.22	6.1-8.4	Low-----------	0.37			
SlA-------------- Starks	0-10	18-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	1-3
	10-36	27-35	1.35-1.55	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	36-58	18-30	1.45-1.65	0.6-2.0	0.16-0.19	5.1-7.8	Moderate-----	0.37			
	58-65	5-20	1.55-1.75	0.6-2.0	0.08-0.18	5.1-7.8	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
SrA*:											
Starks----------	0-11	18-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	1-3
	11-36	27-35	1.35-1.55	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	36-49	18-30	1.45-1.65	0.6-2.0	0.16-0.19	5.1-7.8	Moderate-----	0.37			
	49-60	5-20	1.55-1.75	0.6-2.0	0.08-0.18	6.1-8.4	Low----------	0.37			
Crosby----------	0-10	11-24	1.35-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.43	3	5	1-3
	10-26	35-45	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.3	Moderate-----	0.43			
	26-60	15-27	1.70-2.00	0.06-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			
StB-------------- St. Charles	0-9	20-27	1.15-1.30	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	5-4	6	1-3
	9-49	25-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	49-70	10-25	1.55-1.75	0.6-2.0	0.11-0.22	5.7-7.8	Low----------	0.37			
Su--------------- Stonelick	0-17	10-22	1.20-1.45	0.6-2.0	0.15-0.20	6.6-8.4	Low----------	0.32	5	5	1-3
	17-60	5-18	1.30-0.15	2.0-6.0	0.08-0.14	7.4-8.4	Low----------	0.24			
Sv--------------- Stonelick Variant	0-9	2-8	1.35-1.55	2.0-6.0	0.09-0.18	7.4-8.4	Low----------	0.24	5	2	.5-2
	9-41	2-8	1.50-1.70	2.0-6.0	0.06-0.11	7.9-8.4	Very low-----	0.17			
	41-60	2-5	1.50-1.75	>20	0.02-0.04	7.9-8.4	Very low-----	0.10			
TgA-------------- Toronto	0-9	18-27	1.30-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	5	2-5
	9-37	27-45	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.32			
	37-54	22-27	1.50-1.70	0.6-2.0	0.15-0.19	5.6-7.8	Moderate-----	0.32			
	54-60	15-27	1.50-1.90	0.2-0.6	0.05-0.10	7.9-8.4	Low----------	0.32			
Ty--------------- Treaty	0-14	28-35	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	7	3-6
	14-36	28-35	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			
	36-59	20-35	1.50-1.70	0.6-2.0	0.15-0.19	6.6-7.8	Moderate-----	0.43			
	59-70	15-27	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			
Ud*. Udorthents											
Wa--------------- Wallkill	0-8	10-27	1.15-1.40	0.6-2.0	0.16-0.21	5.1-7.8	Low----------	0.37	5	5	1-3
	8-20	15-27	1.15-1.40	0.6-2.0	0.15-0.20	5.1-7.8	Low----------	0.32			
	20-60	---	0.25-0.45	2.0-6.0	0.35-0.45	5.6-7.8	-------------	----			
Wb--------------- Washtenaw	0-8	15-27	1.30-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.37	5	5	1-3
	8-25	15-27	1.30-1.50	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.37			
	25-54	28-35	1.40-1.60	0.06-0.2	0.15-0.20	6.1-7.8	Moderate-----	0.37			
	54-60	15-25	1.45-1.65	0.06-0.2	0.05-0.19	7.4-8.4	Moderate-----	0.37			
WcA-------------- Waupecan	0-11	15-27	1.15-1.30	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	4	6	2-4
	11-35	25-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-7.3	Moderate-----	0.43			
	35-72	10-25	1.55-1.75	2.0-6.0	0.08-0.18	4.5-7.3	Low----------	0.10			
	72-80	3-10	1.60-1.80	>20	0.02-0.04	6.6-8.4	Low----------	0.10			
WdA-------------- Waynetown	0-14	10-20	1.30-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	5	.5-2
	14-32	27-34	1.55-1.65	0.6-2.0	0.18-0.22	5.6-6.5	Moderate-----	0.37			
	32-45	20-30	1.40-1.65	0.6-2.0	0.13-0.17	5.6-6.5	Moderate-----	0.37			
	45-70	18-30	1.50-1.65	0.6-2.0	0.06-0.13	6.1-7.8	Moderate-----	0.28			
	70-75	1-5	1.60-1.85	6.0-20	0.02-0.04	7.9-8.4	Low----------	0.10			
WeB-------------- Wea	0-10	18-27	1.30-1.45	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.32	5	5	2-5
	10-27	20-35	1.40-1.60	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.43			
	27-54	15-25	1.35-1.50	0.6-2.0	0.10-0.12	5.6-7.3	Low----------	0.24			
	54-60	1-7	1.50-1.75	>20	0.02-0.04	7.4-8.4	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 erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
WfG*:											
Weikert	0-15	15-27	1.20-1.40	2.0-6.0	0.08-0.14	5.6-7.8	Low	0.28	2	8	1-3
	15	---	---	---	---	---	------------	----			
Rock outcrop.											
WkA	0-10	10-22	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5	1-2
Whitaker	10-18	27-34	1.55-1.65	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.37			
	18-52	20-34	1.55-1.65	0.6-2.0	0.15-0.19	5.1-7.8	Moderate	0.37			
	52-56	3-10	1.55-1.75	0.6-6.0	0.10-0.20	6.6-8.4	Low	0.37			
	56-60	5-15	1.55-1.85	0.2-0.6	0.05-0.10	7.4-8.4	Low	0.37			
XgB2*:											
Xenia	0-9	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
	9-27	27-35	1.45-1.65	0.2-0.6	0.18-0.20	4.1-6.0	Moderate	0.37			
	27-45	27-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.3	Moderate	0.37			
	45-60	15-27	1.55-1.90	0.2-0.6	0.05-0.10	7.9-8.4	Low	0.37			
Birkbeck	0-10	20-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	5	6	1-3
	10-55	25-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.5	Moderate	0.37			
	55-66	20-27	1.40-1.60	0.6-2.0	0.14-0.20	5.6-8.4	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 "rare," "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				
AfA: Alford	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
Bc: Beckville	B	Occasional	Brief	Jan-May	1.5-3.0	Apparent	Jan-May	>60	---	High	Low	Low.
Be: Belleville	B/D	None	---	---	+1-1.0	Apparent	Nov-May	>60	---	High	High	Low.
BoA: Bowes Variant	B	None	---	---	2.0-6.0	Apparent	Dec-May	>60	---	High	Moderate	Moderate.
BpC3: Boyer	B	None	---	---	>6.0	---	---	>60	---	Low	Low	Moderate.
BrA: Brenton	B	None	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
BxA: Brenton Variant	B	None	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High	High	Moderate.
CbA, CbB, CbC2: Camden	B	None	---	---	>6.0	---	---	>60	---	High	Low	Moderate.
CcF: Casco	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Ce: Ceresco	B	Occasional	Long	Mar-May	1.0-2.0	Apparent	Sep-May	>60	---	High	Low	Moderate.
Cg: Chagrin	B	Rare	---	---	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low	Moderate.
Ck: Cohoctah	B/D	Frequent	Brief to long.	Nov-Apr	0-1.0	Apparent	Sep-May	>60	---	High	High	Low.
CwA: Crosby	C	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
CyB2*:												
Crosby	C	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
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				
Cz----------------- Cyclone	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High------	High------	Low.
Du----------------- Drummer	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High------	High------	Moderate.
FdA, FdB----------- Fincastle	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High------	High------	Moderate.
FgB2*:												
Fincastle---------	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High------	High------	Moderate.
Miami-------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
HeF---------------- Hennepin	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low-------	Low.
HxF*:												
Hennepin----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low-------	Low.
Rock outcrop.												
JaB---------------- Jasper	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Lb----------------- Landes Variant	A	Rare---------	---	---	>6.0	---	---	>60	---	Low-------	Low-------	Low.
Lo----------------- Lobdell	B	Rare---------	---	---	2.0-3.5	Apparent	Dec-Apr	>60	---	High------	Low-------	Moderate.
Mb, Mc------------- Mahalasville	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High------	High------	Low.
MdD2*, MeB*, MeC*:												
Martinsville------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ockley------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MoC2, MoE2, MpC3, MpD3------------- Miami	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MrC2*:												
Miami-------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Xenia-------------	B	None---------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High------	High------	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				
Ms---------------- Milford	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Mt---------------- Milford Variant	D	None---------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	Moderate	Low.
MuA--------------- Millbrook	B	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
MvA--------------- Millbrook Variant	B	None---------	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High-----	High-----	High.
Mw, My------------ Muskego	A/D	None---------	---	---	+1-1.0	Apparent	Nov-Aug	>60	---	High-----	Moderate	Moderate.
ObA, OcA, OcB, OcC2, OfB2, OfC2- Ockley	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
OhB--------------- Ockley	B	None---------	---	---	>6.0	---	---	40-70	Soft	Moderate	Moderate	Moderate.
OnB, OnC---------- Octagon	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
OsB--------------- Ormas	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Pd---------------- Palms	A/D	None---------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
PfB--------------- Parr	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Ph---------------- Pella	B/D	None---------	---	---	+.5-2.0	Apparent	Dec-Jun	>60	---	High-----	High-----	Low.
Po*, Pq*. Pits												
PrA--------------- Proctor	B	None---------	---	---	2.5-6.0	Apparent	Jan-May	>60	---	High-----	Moderate	Moderate.
PrB--------------- Proctor	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Ra---------------- Ragsdale	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic 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				
ReA----------------- Raub	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
RlA----------------- Reesville	C	None--------	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
RnA*:												
Reesville--------	C	None--------	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
Fincastle--------	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
RoG*:												
Rodman-----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Rock outcrop.												
RtA, RtB---------- Rush	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
RwA----------------- Rush Variant	B	None--------	---	---	2.0-6.0	Apparent	Jan-May	>60	---	High-----	High-----	Moderate.
RxC----------------- Russell	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Sa------------------ Saranac	C	Frequent----	Brief-----	Dec-May	+.5-1.0	Apparent	Dec-Jun	>60	---	High-----	High-----	Low.
Sb------------------ Saranac	C	Occasional	Brief-----	Dec-May	+.5-1.0	Apparent	Dec-Jun	>60	---	High-----	High-----	Low.
SdB----------------- Shadeland	C	None--------	---	---	1.0-2.0	Perched	Jan-Apr	20-40	Hard	High-----	High-----	Moderate.
Sf------------------ Shoals	C	Occasional	Brief-----	Oct-Jun	0.5-1.5	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
SlA----------------- Starks	C	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
SrA*:												
Starks-----------	C	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Crosby-----------	C	None--------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
StB----------------- St. Charles	B	None--------	---	---	>6.0	---	---	>60	---	High-----	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				
Su----------------- Stonelick	B	Occasional	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
Sv----------------- Stonelick Variant	A	Frequent----	Brief-----	Jan-May	>6.0	---	---	>60	---	Low------	Moderate	Low.
TgA---------------- Toronto	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	High.
Ty----------------- Treaty	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Ud*. Udorthents												
Wa----------------- Wallkill	B/D	None--------	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High-----	Moderate	Moderate.
Wb----------------- Washtenaw	C/D	Frequent----	Brief-----	Dec-May	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
WcA---------------- Waupecan	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
WdA---------------- Waynetown	C	None--------	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High-----	High-----	Moderate.
WeB---------------- Wea	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
WfG*:												
Weikert----------	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
Rock outcrop.												
WkA---------------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.
XgB2*:												
Xenia------------	B	None--------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.
Birkbeck---------	B	None--------	---	---	3.0-6.0	Apparent	Mar-May	>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
*Alford	Fine-silty, mixed, mesic Typic Hapludalfs
Beckville	Coarse-loamy, mixed, nonacid, mesic Aquic Udifluvents
Belleville	Sandy over loamy, mixed, mesic Typic Haplaquolls
Birkbeck	Fine-silty, mixed, mesic Typic Hapludalfs
Bowes Variant	Fine-silty, mixed, mesic Mollic Hapludalfs
Boyer	Coarse-loamy, mixed, mesic Typic Hapludalfs
Brenton	Fine-silty, mixed, mesic Aquic Argiudolls
Brenton Variant	Fine-silty, mixed, mesic Aquic Argiudolls
*Camden	Fine-silty, mixed, mesic Typic Hapludalfs
Casco	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Ceresco	Coarse-loamy, mixed, mesic Fluvaquentic Hapludolls
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Cohoctah	Coarse-loamy, mixed, mesic Fluvaquentic Haplaquolls
*Crosby	Fine, mixed, mesic Aeric Ochraqualfs
*Cyclone	Fine-silty, mixed, mesic Typic Argiaquolls
Drummer	Fine-silty, mixed, mesic Typic Haplaquolls
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Jasper	Fine-loamy, mixed, mesic Typic Argiudolls
Landes Variant	Sandy, mixed, mesic Fluventic Hapludolls
Lobdell	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Mahalasville	Fine-silty, mixed, mesic Typic Argiaquolls
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Milford Variant	Clayey over fine-silty, mixed, mesic Typic Haplaquolls
*Millbrook	Fine-silty, mixed, mesic Udollic Ochraqualfs
Millbrook Variant	Fine-silty, mixed, mesic Udollic Ochraqualfs
Muskego	Coprogenous, euic, mesic Limnic Medisaprists
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Octagon	Fine-loamy, mixed, mesic Mollic Hapludalfs
Ormas	Loamy, mixed, mesic Arenic Hapludalfs
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Parr	Fine-loamy, mixed, mesic Typic Argiudolls
Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Proctor	Fine-silty, mixed, mesic Typic Argiudolls
*Ragsdale	Fine-silty, mixed, mesic Typic Argiaquolls
Raub	Fine-silty, mixed, mesic Aquic Argiudolls
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Rodman	Sandy-skeletal, mixed, mesic Typic Hapludolls
Rush	Fine-silty, mixed, mesic Typic Hapludalfs
Rush Variant	Fine-silty, mixed, mesic Aquic Hapludalfs
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Saranac	Fine, mixed, mesic Fluvaquentic Haplaquolls
Shadeland	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Starks	Fine-silty, mixed, mesic Aeric Ochraqualfs
St. Charles	Fine-silty, mixed, mesic Typic Hapludalfs
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Stonelick Variant	Sandy, mixed (calcareous), mesic Mollic Udifluvents
*Toronto	Fine-silty, mixed, mesic Udollic Ochraqualfs
Treaty	Fine-silty, mixed, mesic Typic Argiaquolls
Udorthents	Loamy, mixed, mesic Typic Udorthents
*Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
*Washtenaw	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Waupecan	Fine-silty, mixed, mesic Typic Argiudolls
Waynetown	Fine-silty, mixed, mesic Aeric Ochraqualfs
Wea	Fine-loamy, mixed, mesic Typic Argiudolls
*Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

☆ U.S. GOVERNMENT PRINTING OFFICE : 1989 O - 183-525 : QL 3

Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.