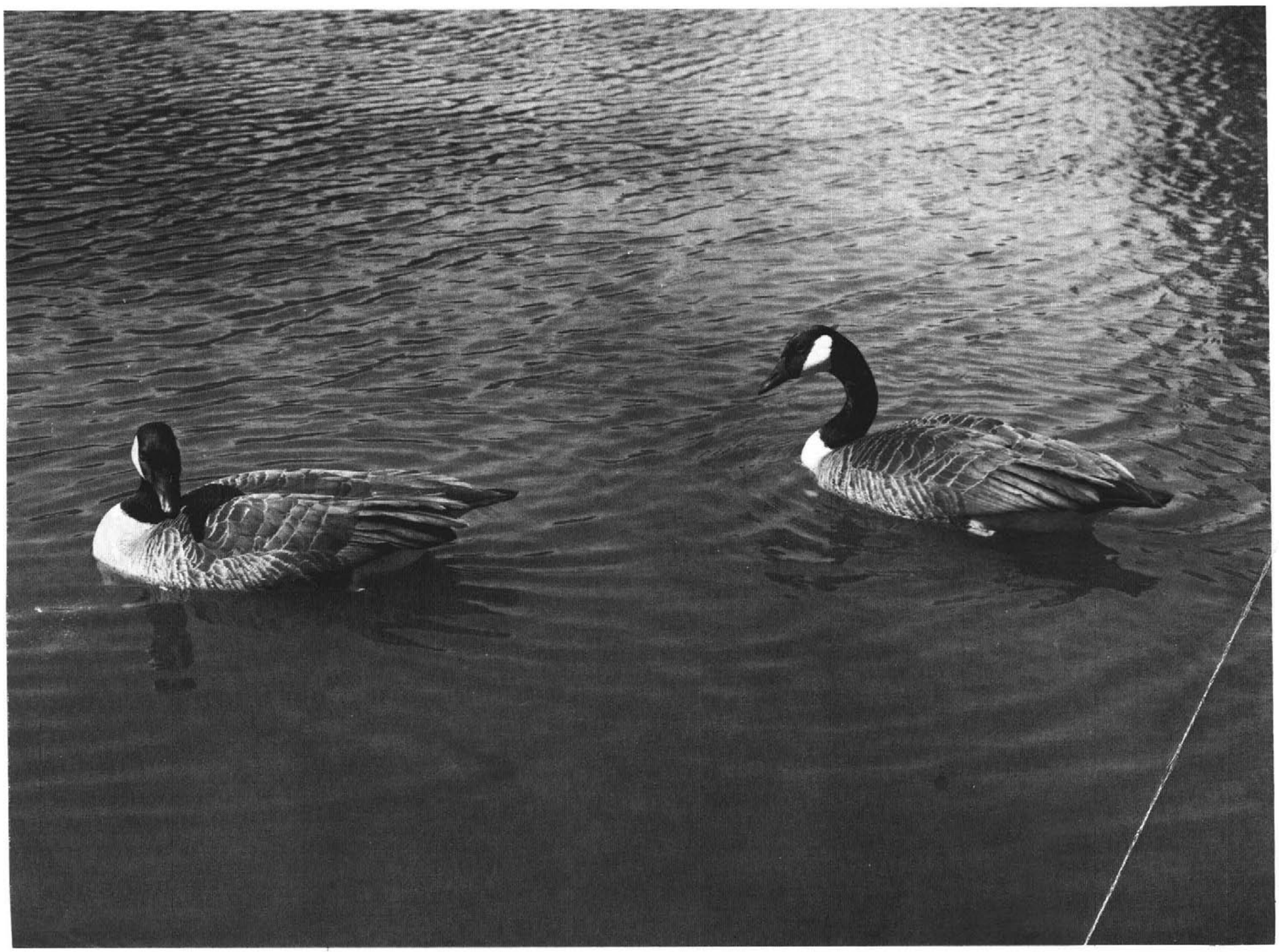
United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Purdue University,
Agricultural Experiment
Station; and Indiana
Department of Natural
Resources, State Soil
Conservation Board and
Division of Soil
Conservation

Soil Survey of Warren County, Indiana



How To Use This Soil Survey

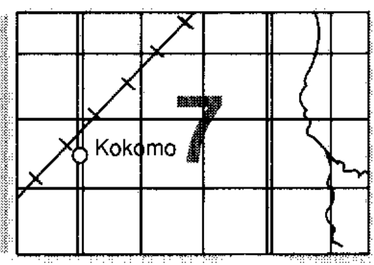
General Soil Map

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.

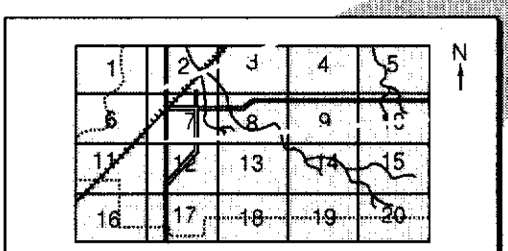
Detailed Soil Maps

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



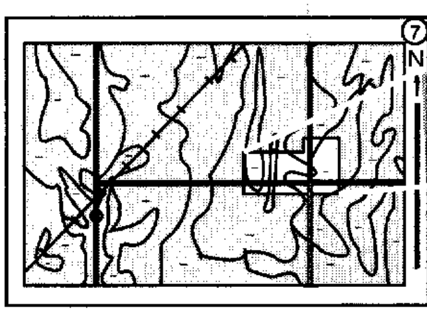
MAP SHEET

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.



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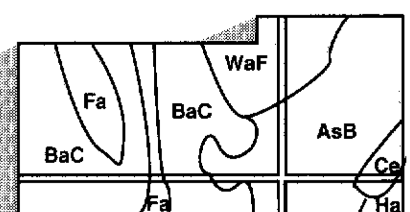

AREA OF INTEREST

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.

Major fieldwork for this soil survey was completed in 1985. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. This survey was made cooperatively by the Soil Conservation Service; Purdue University, Agricultural Experiment Station; and Indiana Department of Natural Resources, State Soil Conservation Board and Division of Soil Conservation. It is part of the technical assistance furnished to the Warren County Soil and Water Conservation District. Financial assistance was made available by the Warren County Board of Commissioners.

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.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An area of undrained Houghton soils used as habitat for wetland wildlife.

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Issued December 1990

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Warren County. 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 Warren County in Indiana.

Soil Survey of Warren County, Indiana

By James R. Barnes, Soil Conservation Service

Fieldwork by James R. Barnes, John H. Hillis, Paul McCarter, Jr., Byron G. Nagel, Jerold Shively, and Gary R. Struben, Soil Conservation Service, and Roxann C. Klika, Lawrence E. McGhee, and Mark S. Plank, Indiana Department of Natural Resources, State Soil Conservation Board

United States Department of Agriculture, Soil Conservation Service, in cooperation with Purdue University, Agricultural Experiment Station, and the Indiana Department of Natural Resources, State Soil Conservation Board and Division of Soil Conservation

General Nature of the County

Warren County is in the west-central part of Indiana. It has an area of 234,413 acres, or 366 square miles. The Wabash River is the southeast boundary. Williamsport is the county seat.

Farming is the economic base of the county. About 86 percent of the county is cropland. The main farm products are cash-grain crops, beef cattle, swine, hay, and some specialty crops.

Urbanization has been slight in recent years. Most residents are employed in agriculture. Industry within the county is very small, and many residents of the county work in adjacent counties. This survey primarily emphasizes the use of soils for farming. It also describes nonfarm uses.

This soil survey updates the survey of Warren County published in 1916 *(4)*. It provides additional information and larger maps, which show the soils in greater detail.

History and Development

Alice Howard, secretary, Warren County Soil and Conservation District, helped prepare this section.

Zachariah Cicott, the son of a French Canadian trader and a Potawatomi Indian, was probably the first settler of what is now Warren County. As early as 1802, Cicott traded with Miami, Potawatomi, and Kickapoo Indians at Independence *(3)*.

As early as 1822, a few pioneers began to settle in the wooded parts of the survey area *(3)*. Knowing little about farming the prairie, they believed that the soil would never produce crops because it was too poor to grow timber. They also believed that they could not survive cold winters on the open prairie. They preferred to remain in the woods, where they could build and heat their homes.

On December 30, 1825, the Indiana General Assembly established Warren County. The county was named after Gen. Joseph Warren, killed in the Battle of Bunker Hill. The county was formed into the townships of Mound, Pike, Warren, and Medina. The entire county was in the valley of the Wabash River.

In 1828, Warrentown was established as the county seat. On January 22, 1829, the county seat was moved to Williamsport, along the Wabash River *(10)*.

As the extent of farming increased in the county, the grain and livestock market of Williamsport grew to great proportions. For large grain shipments, a side-cut canal was built to enable boats laden with grain to reach the river. The boats then crossed from Williamsport to Attica, which already had a canal *(3)*.

The Wabash Railroad was completed in 1856-57, and use of the canal began to decline. The canal soon went out of commission, and the business district in Williamsport shifted from the riverfront to its present location in the uplands. Fall Creek, which runs through Williamsport, has a waterfall almost 80 feet high. In the late 1800's, fine sandstone quarried near the heart of Williamsport was used as building material for many commercial buildings and for houses.

At present, Warren County consists of 12 townships. One of these, Jordan Township, was originally thought to be too wet and marshy to be farmed. It had no timber for use in building, and the early settlers purchased land in this township only for summer grazing of livestock. The railroad showed the full potential of this rich, fertile survey area. The markets that it opened greatly increased grain production, and numerous livestock were fed out. Cream and hog-dressed veal calves were shipped to Chicago.

Relief and Drainage

The landscape in Warren County is mainly one of nearly level and gently sloping ground moraines and nearly level to moderately sloping end moraines. The Crawfordsville Moraine is in the central part of the county, the Cropsey Moraine is in the northwestern part, and the Normal and Bloomington Moraines are in the southwestern part (fig. 1). The more sloping soils are on the scattered end moraines throughout the county and on the breaks adjacent to the soils on flood plains along the Wabash River and its tributaries. The flood plains border outwash terraces. A few scattered areas of mucky soils are mainly in the northern half of the county.

The highest elevation in the county, about 5 miles northeast of Tab, is about 830 feet above sea level. The lowest elevation is about 480 feet above sea level. It is in an area where the Wabash River flows out of the county into Vermillion County.

Nine main streams drain the county. The Wabash River flows southwest along the eastern boundary of the county. Little Pine and Kickapoo Creeks, in the northeastern part of the county, flow south into the Wabash River. Big Pine and Mud Pine Creeks are in the north-central part. Mud Pine Creek flows south, and Big Pine Creek flows southwest. Mud Pine Creek eventually merges with Big Pine Creek, which then flows southeast into the Wabash River.

Jordan Creek, in the west-central part of the county, flows southwest into the state of Illinois. Rock Creek, Redwood Creek, and Opossum Run, in the southwestern part, flow southeast into the Wabash River. Numerous smaller natural drainageways are throughout the county. On many soils a drainage system is needed for crop production. This should consist of subsurface drainage pipes and open drainage ditches, which can be used individually or in combination.

Water Supply

Ground water, the main source of water in Warren County, is sufficient in most areas. The principal sources of water are sand and gravel deposits near streams and layers of sand and gravel intermixed with glacial till or in the underlying bedrock. In the area of the county that is in the valley of the Wabash River, wells in the sand and gravel are generally less than 100 feet deep. These wells can yield more than 250 gallons per minute. In the west-central and northeastern parts of the county and in a small area in the extreme north-central part, extensive water-bearing sand and gravel formations lie within the glacial till. Their capacities range from 150 to 250 gallons per minute.

The areas lowest in well capacity have a thin deposit of glacial drift. One of these is parallel to the Wabash River. It is 2 to 4 miles wide. Another is an area along Big Pine Creek from its mouth to its juncture with Mud Pine Creek. Most wells in these areas are in bedrock and yield less than 25 gallons per minute.

The rest of the county has a fairly deep deposit of glacial drift. Some wells are in sand and gravel within glacial till, and some are in bedrock. These wells have capacities ranging from 25 to 150 gallons per minute *(6)*.

Climate

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

Warren County is cold in winter and quite hot in summer. Occasional cool spells occur in summer. Precipitation in winter frequently occurs as snowstorms. During the warm months, when warm moist air moves in from the south, the precipitation occurs chiefly as showers, which are often heavy. The total annual rainfall is normally adequate for corn, soybeans, and small grain.

Tornadoes and severe thunderstorms occur occasionally. These storms are local in extent and of short duration, and they result in sparse damage in narrow belts. Hailstorms occur at times during the warmer part of the year in scattered small areas.

Table 1 gives data on temperature and precipitation

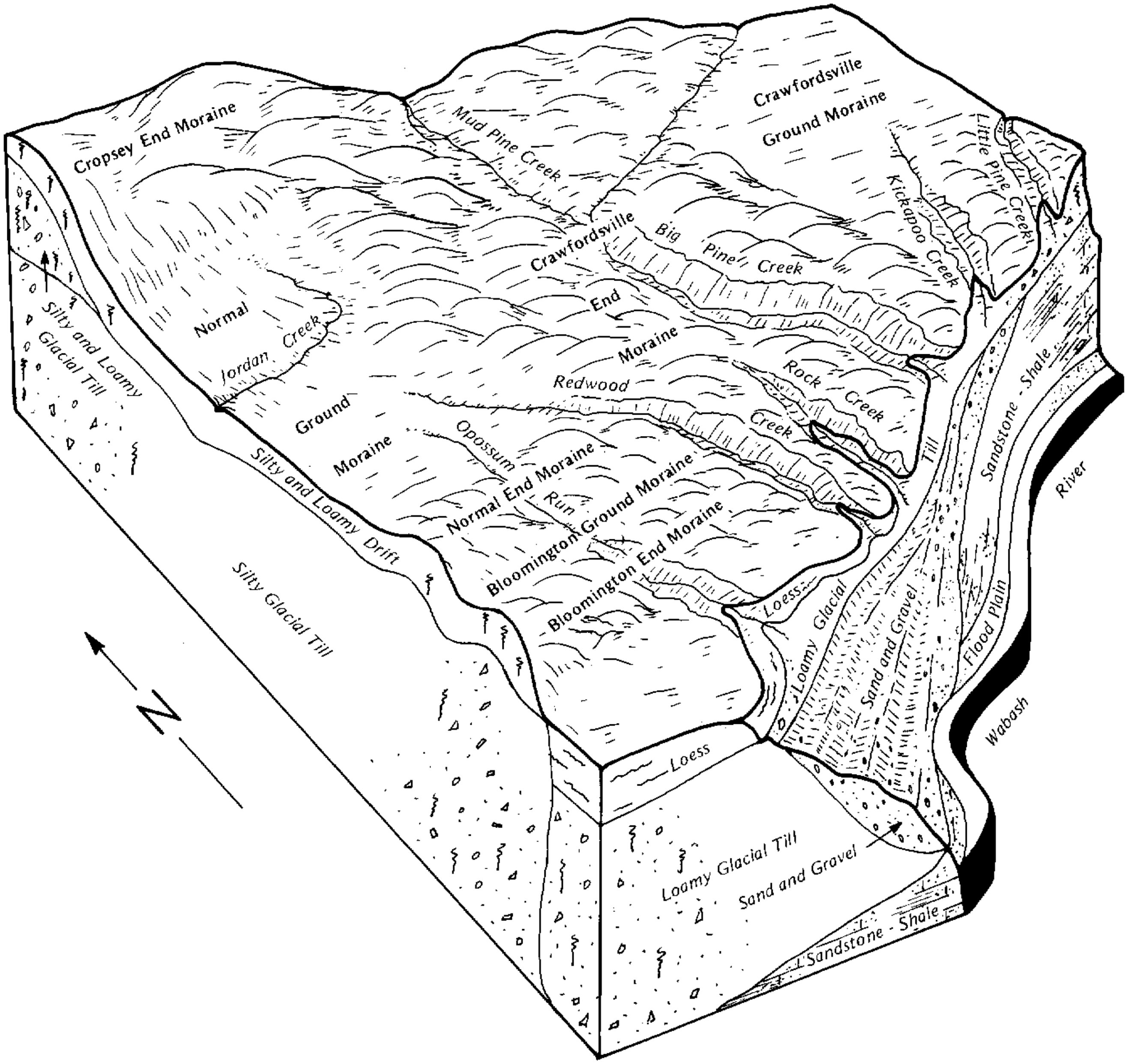

Figure 1.—Physiography and drainage in Warren County, Indiana.

for the survey area as recorded at Fowler, Indiana, in the period 1951 to 1972. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 28 degrees F and the average daily minimum temperature is 20 degrees F. The lowest temperature on record, which occurred at Fowler on January 16, 1972, is -18 degrees F. In summer, the average temperature is 73 degrees and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 106 degrees F.

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 (50 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 36.59 inches. Of this, about 23 inches, or more than 58 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 4.51 inches at Fowler on July 23, 1957. Thunderstorms occur on about 40 days each year.

The average seasonal snowfall is about 25 inches. The greatest snow depth at any one time during the period of record was 13 inches. On the average, 16 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the southwest. The average windspeed is highest, 12 miles per hour, in spring.

Transportation Facilities

About 20 miles of federal highways and 86 miles of state highways cross the county in all directions. Also, the county has about 550 miles of county roads. About one-third of these roads are paved, and the rest are covered with either crushed gravel or packed dirt.

Although Warren County has no airport, it does have several small airstrips. The closest airport served by commercial airlines is in West Lafayette, about 25 miles away.

Two railway lines run through the county. One line runs north to south in the western part of the county, and the other runs northeast to southwest in the south-central part.

Trends in Population and Land Use

According to the 1980 census, Warren County has a population of 8,976 and a population density of about 25 people per square mile. The population was 10,899 in 1910; 8,545 in 1960; and 8,705 in 1970. It increased by about 1.9 percent from 1960 to 1970 and by about 3.1 percent from 1970 to 1980. The population of Williamsport was 1,747 in 1980. The other major towns and their populations are West Lebanon, 946; Pine Village, 257; and State Line City, 233 *(5)*.

About 86 percent of the acreage in the county is cropland, including permanent pasture. The rest of the county consists of urban land, farmsteads, and woodland. A relatively small acreage is being developed for residential and business uses. It is mainly around Williamsport and West Lebanon and along State Route 63.

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 biological 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 a considerable degree of 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, reaction, 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 interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are 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 are 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 predict with a fairly high degree of accuracy 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.

Some of the boundaries on the general soil map of Warren County do not match those on the general soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. The differences are mainly a result of improvements in the classification of soils, particularly modifications or refinements in soil series concepts. Also, there may be differences in the intensity of mapping or in the extent of the soils in the counties.

Soil Descriptions

Areas Dominated by Deep, Nearly Level Soils That Are Somewhat Poorly Drained and Poorly Drained; on Uplands

These soils are in nearly level areas that have many swells, swales, and drainageways. The soils are used mainly for cultivated crops. The main management concerns are ponding and excess water.

1. Drummer-Williamsport-Brenton, Moderately Fine Substratum, Association

Silty soils that are nearly level, and poorly drained and somewhat poorly drained; formed in silty sediments and outwash; in silty sediments, loamy outwash, and glacial till; and in silty sediments and loamy outwash; on ground moraines

This association consists of soils on uplands that have many slight swells and depressions. It makes up about 14 percent of the county. It is about 40 percent Drummer soils, 13 percent Williamsport soils, 12 percent Brenton soils that have a moderately fine substratum, and 35 percent minor soils.

Drummer soils are poorly drained. They are in broad, flat, low areas; in depressional areas; along and in narrow drainageways; and in swales. Typically, they have a surface layer and subsurface layer of black silty clay loam. The subsoil is dark gray, grayish brown, and light olive gray silty clay loam and light brownish gray silt loam.

Williamsport soils are somewhat poorly drained. They are in flat, low areas; along and in drainageways; and on low rises. Typically, they have a surface layer and subsurface layer of very dark gray silt loam. The subsoil is dark brown silty clay, brown silty clay loam, yellowish brown loam, and light olive brown silt loam.

Brenton soils are somewhat poorly drained. They are in broad, flat areas and on low rises. Typically, they have a surface layer and subsurface layer of very dark grayish brown silt loam. The subsoil is dark brown and dark yellowish brown silty clay loam and brown fine sandy loam.

The minor soils in this association are the moderately well drained Glenhall, Markham, Proctor, and Symerton soils in the higher and more sloping positions on the landscape and the somewhat poorly drained Elliott soils in the same position on the landscape as the Williamsport soils.

The soils in this association are used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Ponding and excess water are the main limitations.

The Drummer soils are generally unsuitable as sites for buildings, local roads and streets, and sanitary facilities. The Williamsport and Brenton soils are poorly suited to these uses. Ponding, the seasonal high water table, frost action, low strength, and moderately slow permeability are the main limitations.

2. Sable-Ipava Association

Silty soils that are nearly level, and poorly drained and somewhat poorly drained; formed in loess; on ground moraines

This association consists of soils on uplands that have some slight swells and depressions. It makes up about 1 percent of the county. It is about 51 percent Sable soils, 43 percent Ipava soils, and 6 percent minor soils.

Sable soils are poorly drained. They are in broad, flat, low areas, in depressional areas, along and in narrow drainageways, and in swales. Typically, they have a surface layer and subsurface layer of black silty clay loam. The subsoil is dark gray, dark grayish brown, grayish brown, and light brownish gray silty clay loam.

Ipava soils are somewhat poorly drained. They are in large flat areas and on slight rises. Typically, they have a surface layer of black silt loam and a subsurface layer of black silty clay loam. The subsoil is pale brown silty clay, grayish brown and light brownish gray silty clay loam, and light yellowish brown silt loam.

The minor soils in this association are the poorly drained Drummer soils in the same positions on the landscape as the Sable soils.

The soils in this association are used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Ponding and excess water are the main limitations.

The Sable soils are generally unsuitable as sites for buildings, local roads and streets, and sanitary facilities. The Ipava soils are poorly suited to these uses. The ponding, the seasonal high water table, frost action, low strength, moderately slow permeability, and the shrink-swell potential are the main limitations.

3. Brenton, Till Substratum-Drummer Association

Silty soils that are nearly level, and somewhat poorly drained and poorly drained; formed in silty sediments and loamy outwash; on ground moraines and end moraines

This association consists of soils on uplands that have many slight swells and swales. It makes up about 12 percent of the county. It is about 38 percent Brenton soils that have a till substratum and similar soils, 27 percent Drummer and similar soils, and 35 percent minor soils (fig. 2).

Brenton soils are somewhat poorly drained. They are in broad, flat areas and on low rises. Typically, they have a surface layer and subsurface layer of very dark gray silt loam. The subsoil is dark brown and brown silty clay loam and silt loam and brown fine sandy loam.

Drummer soils are poorly drained. They are in broad, flat, low areas, in depressional areas, along and in narrow drainageways, and in swales. Typically, they have a surface layer and subsurface layer of black silty clay loam. The subsoil is dark gray, grayish brown, and light olive gray silty clay loam and light brownish gray silt loam.

The minor soils in this association are the moderately well drained Barce, Glenhall, Montmorenci, and Proctor soils. These soils are higher on the landscape and more sloping than the Brenton soils.

Most areas of this association are cultivated. The soils generally are well suited to cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. Ponding and excess water are the main limitations.

The Brenton soils are poorly suited to buildings, local roads and streets, and sanitary facilities. The Drummer soils are generally unsuited to these uses. The ponding, the seasonal high water table, frost action, low strength, and moderately slow permeability are the main limitations.

Areas Dominated by Deep, Nearly Level to Moderately Steep Soils That Are Moderately Well Drained to Poorly Drained; on Uplands

These soils are on an undulating to hilly landscape that has many swales, swells, and drainageways. The soils are used mainly for cultivated crops. Ponding, excess water, erosion, runoff, and the slope are the main management concerns.

4. Markham-Drummer-Williamsport Association

Silty soils that are nearly level and gently sloping, and moderately well drained to poorly drained; formed in silty sediments and glacial till; in silty sediments and outwash; and in silty sediments, loamy outwash, and glacial till; on end moraines

This association consists of soils on uplands. The landscape is undulating and has many swales, swells, and depressional areas. The association makes up about 8 percent of the county. It is about 27 percent Markham soils, 21 percent Drummer soils, 19 percent

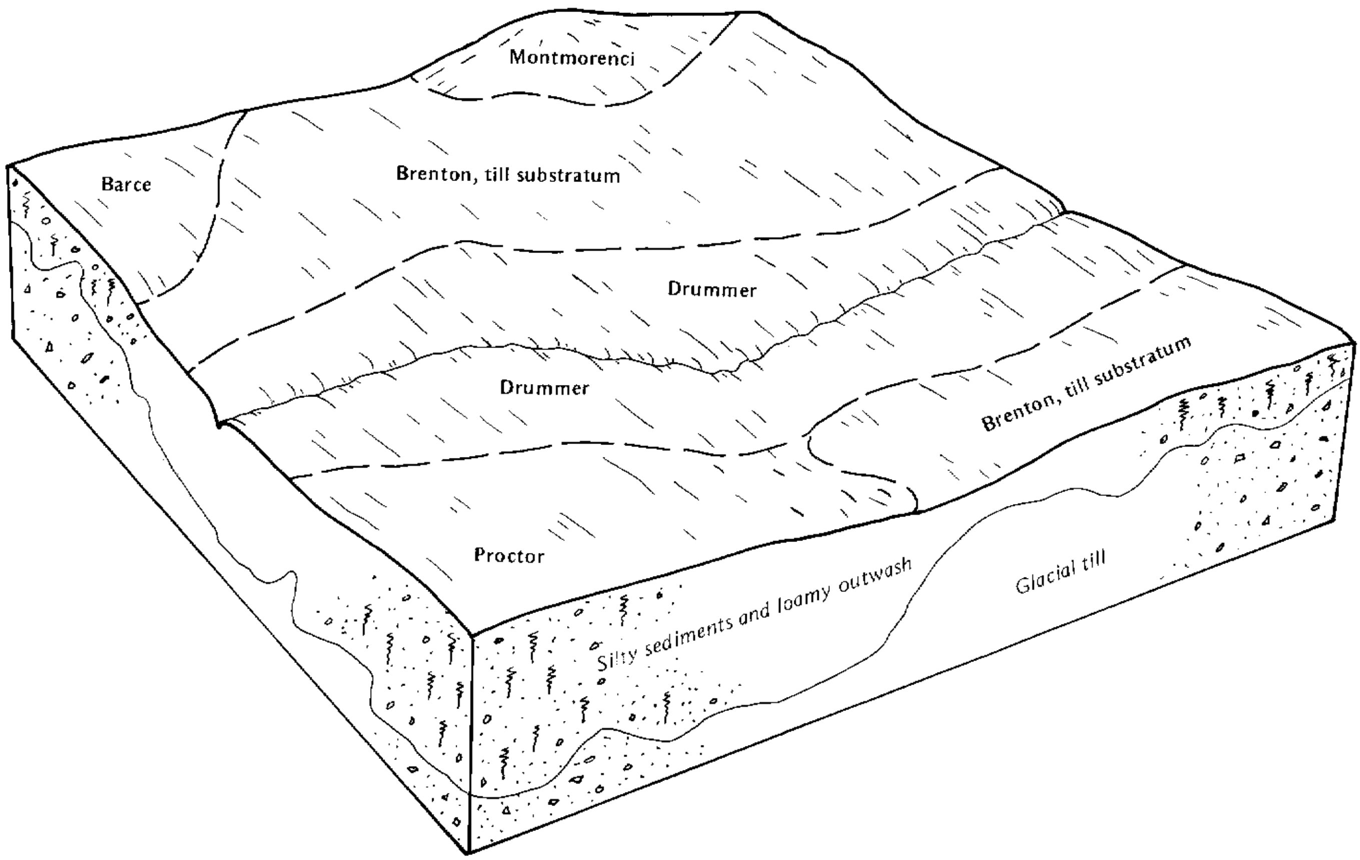

Figure 2.—Pattern of soils and parent material in the Brenton, till substratum-Drummer association.

Williamsport soils, and 33 percent minor soils (fig. 3).

Markham soils are gently sloping and moderately well drained. They are in broad areas, on high rises, on side slopes, on ridgetops, along drainageways, and on knolls. Typically, they have a surface layer of very dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is yellowish brown, light olive brown, and olive brown silty clay loam.

Drummer soils are nearly level and poorly drained. They are in broad, flat, low areas, in depressional areas, along and in narrow drainageways, and in swales. Typically, they have a surface layer and subsurface layer of black silty clay loam. The subsoil is dark gray, grayish brown, and light olive gray silty clay loam and light brownish gray silt loam.

Williamsport soils are nearly level and somewhat poorly drained. They are along and in drainageways, in flat, low areas, and on low rises. Typically, they have a surface layer and subsurface layer of very dark gray silt loam. The subsoil is dark brown silty clay, brown silty clay loam, yellowish brown loam, and light olive brown silt loam.

The minor soils in this association are the moderately well drained Symerton and Varna soils and the somewhat poorly drained Brenton and Elliott soils. Symerton and Varna soils are slightly less sloping than the Markham soils. Brenton and Elliott soils are in positions on the landscape similar to those of the Williamsport soils.

Most areas of this association are cultivated. The soils generally are well suited to cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. Ponding, the seasonal high water table, erosion, and runoff are the main limitations.

This association generally is poorly suited to buildings, local roads and streets, and sanitary facilities. The Drummer soils are generally unsuited to these uses. The Markham soils are fairly well suited to

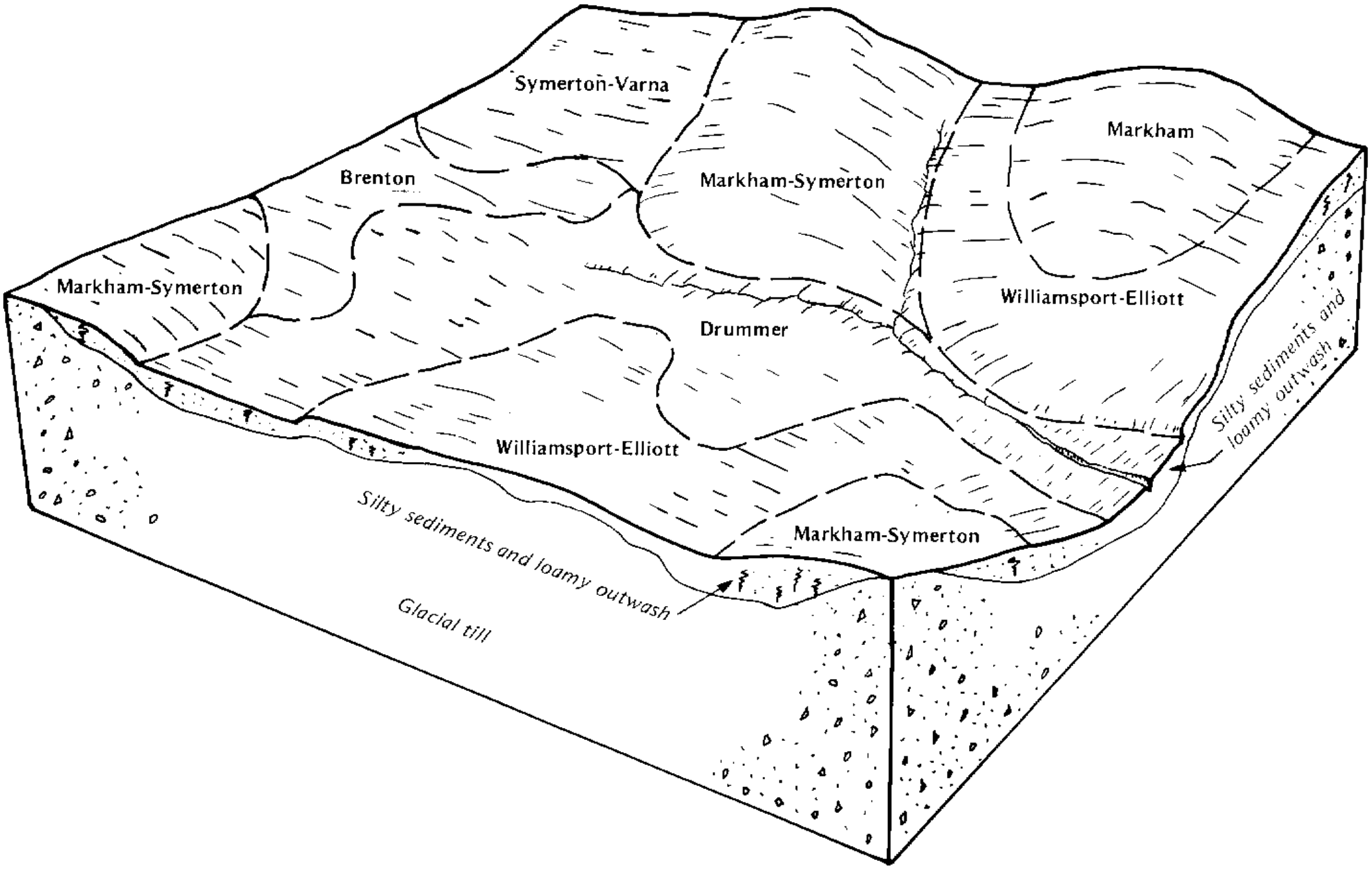

Figure 3.—Pattern of soils and parent material in the Markham-Drummer-Williamsport association.

building site development. The ponding, the seasonal high water table, the shrink-swell potential, frost action, low strength, and moderately slow permeability are the main limitations.

5. Drummer-Barce-Brenton, Till Substratum-Montmorenci Association

Silty soils that are nearly level to moderately sloping, and poorly drained to moderately well drained; formed in silty sediments and loamy outwash; in silty sediments, loamy outwash, and glacial till; and in glacial till; on end moraines

This association consists of soils on uplands. The landscape is undulating and gently rolling and has many broad ridges, knobs, and depressional areas. The association makes up about 14 percent of the county. It is about 28 percent Drummer soils, 18 percent Barce soils, 12 percent Brenton soils that have a till substratum and similar soils, 10 percent Montmorenci soils, and 32 percent minor soils.

Drummer soils are nearly level and poorly drained. They are in broad, flat, low areas, in depressional areas, along and in narrow drainageways, and in swales. Typically, they have a surface layer and subsurface layer of black silty clay loam. The subsoil is dark gray, grayish brown, and light olive gray silty clay loam and light brownish gray silt loam.

Barce soils are nearly level to moderately sloping and are moderately well drained. They are along drainageways and on broad flats, rises, ridgetops, long side slopes, and knolls. Typically, they have a surface layer of very dark gray silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is yellowish brown silty clay loam and loam and dark brown sandy clay loam.

Brenton soils are nearly level and somewhat poorly drained. They are in broad, flat areas and on low rises.

Typically, they have a surface layer and subsurface layer of very dark gray silt loam. The subsoil is dark brown and brown silty clay loam and silt loam and brown fine sandy loam.

Montmorenci soils are gently sloping or moderately sloping and are moderately well drained. They are along drainageways and on rises, broad flats, long side slopes, ridgetops, and knolls. Typically, they have a surface layer of dark brown silt loam mixed with dark yellowish brown loam from the subsoil. The subsoil is dark yellowish brown loam and yellowish brown clay loam and loam.

The minor soils in this association include the moderately well drained Glenhall and Proctor soils in the same position on the landscape as the Barce soils. They also include the somewhat poorly drained Gilboa and La Hogue soils downslope from the higher areas in the unit and the very poorly drained Milford and Peotone soils in depressional areas.

The soils in this association are used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. Some of the more sloping soils are used for hay or pasture. The association is well suited to cultivated crops, hay, and pasture. Ponding, the seasonal high water table, erosion, and runoff are the main limitations.

This association generally is poorly suited to local roads and streets and sanitary facilities. The Drummer soils are generally unsuited to these uses. The Barce and Montmorenci soils are fairly well suited to building site development. The ponding, the seasonal high water table, the shrink-swell potential, frost action, low strength, the slope, and moderately slow permeability are the main limitations.

6. Rainsville-Williamstown-Rockfield-Starks Association

Silty soils that are nearly level to moderately sloping, and moderately well drained or somewhat poorly drained; formed in silty sediments, loamy outwash, and glacial till; in silty sediments and glacial till; and in silty sediments and loamy outwash; on end moraines and ground moraines

This association consists of soils on uplands. The landscape is undulating and gently rolling. It is dominated by broad ridges, knobs, and narrow depressions. The association makes up about 28 percent of the county. It is about 19 percent Rainsville and similar soils, 16 percent Williamstown and similar soils, 16 percent Rockfield and similar soils, 14 percent Starks and similar soils, and 35 percent minor soils.

Rainsville soils are nearly level to moderately sloping and are moderately well drained. They are along drainageways, in broad areas, and on rises, ridgetops, long side slopes, and knolls. Typically, they have a surface layer of dark grayish brown silt loam mixed with dark yellowish brown silt loam from the subsoil. The subsoil is dark yellowish brown silt loam; yellowish brown clay loam; and dark brown, strong brown, and olive brown loam.

Williamstown soils are gently sloping or moderately sloping and are moderately well drained. They are along drainageways, in broad areas, and on rises, long side slopes, ridgetops, and knolls. Typically, they have a surface layer of dark grayish brown silt loam mixed with light yellowish brown silt loam from the subsoil. The subsoil is light yellowish brown silt loam and yellowish brown clay loam and loam.

Rockfield soils are nearly level or gently sloping and are moderately well drained. They are along drainageways, in broad areas, and on rises, long side slopes, ridgetops, and knolls. Typically, they have a surface layer of brown silt loam. The subsoil is yellowish brown silt loam, silty clay loam, and loam and light yellowish brown loam.

Starks soils are nearly level and somewhat poorly drained. They are in flat, low areas, along narrow drainageways, and on low rises. Typically, they have a surface layer of dark grayish brown silt loam. The subsoil is brown and yellowish brown silty clay loam and yellowish brown loam.

The minor soils in this association are the well drained Hennepin, Miami, and Strawn soils in the more sloping areas and the poorly drained Cyclone soils in the lower areas.

The soils in this association are used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. Some of the more sloping soils are used for hay, pasture, or woodland.

This association is well suited to cultivated crops, hay, and pasture. The seasonal high water table, erosion, and runoff are the main limitations.

This association is well suited to woodland. Excess water in the low areas, erosion, and runoff are the main limitations.

In most areas this association is fairly well suited to building site development. It is poorly suited to local roads and streets and sanitary facilities. The seasonal high water table, the shrink-swell potential, low strength, frost action, the slope, and moderately slow permeability are the main limitations.

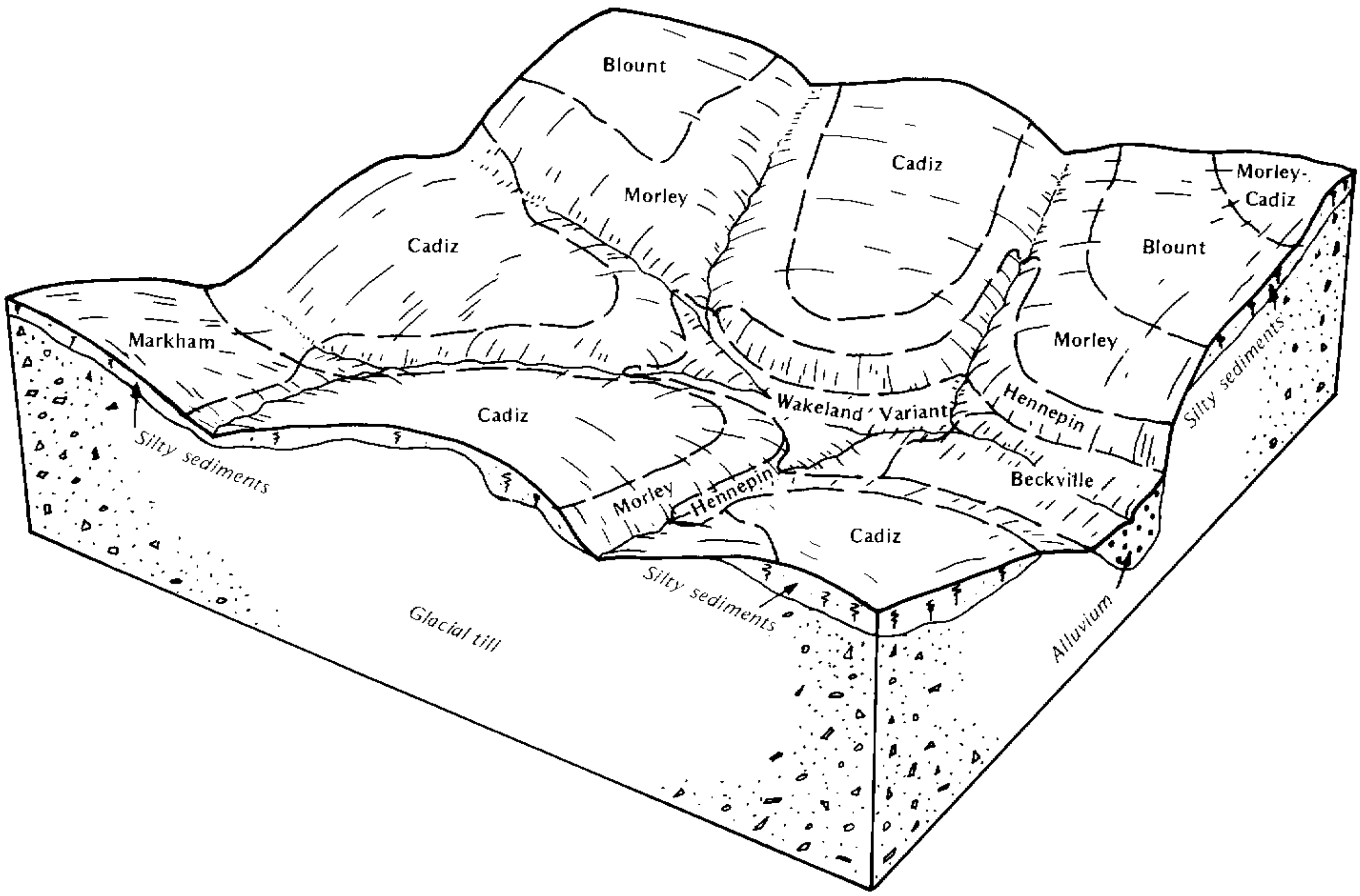

Figure 4.—Pattern of soils and parent material in the Cadiz-Morley association.

7. Cadiz-Morley Association

Silty soils that are nearly level to moderately steep, and moderately well drained; formed in silty sediments and glacial till; on end moraines

This association consists of soils on uplands. The landscape is undulating to hilly. It is dominated by broad ridges, knobs, and narrow depressions. The association makes up about 8 percent of the county. It is about 41 percent Cadiz soils, 24 percent Morley soils, and 35 percent minor soils (fig. 4).

Cadiz soils are nearly level to moderately sloping. They are in broad areas along drainageways and on rises, ridgetops, long side slopes, and knolls. Typically, they have a surface layer of brown silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is yellowish brown and light olive brown silty clay loam and light olive brown silt loam.

Morley soils are moderately sloping to moderately steep. They are along drainageways and on rises, side slopes, ridgetops, and knolls. Typically, they have a surface layer of brown silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is yellowish brown and light olive brown silty clay loam.

The minor soils in this association are the well drained Hennepin soils on the steeper breaks, the moderately well drained Beckville soils in the lower areas at the base of slopes, the moderately well drained Markham soils in the slightly lower areas, the somewhat poorly drained Blount soils on upland flats, and the somewhat poorly drained Wakeland Variant soils on the lower bottom land.

The soils in this association are used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage that requires a drainage system has been drained. Many areas of the more sloping soils are used for hay, pasture, or woodland.

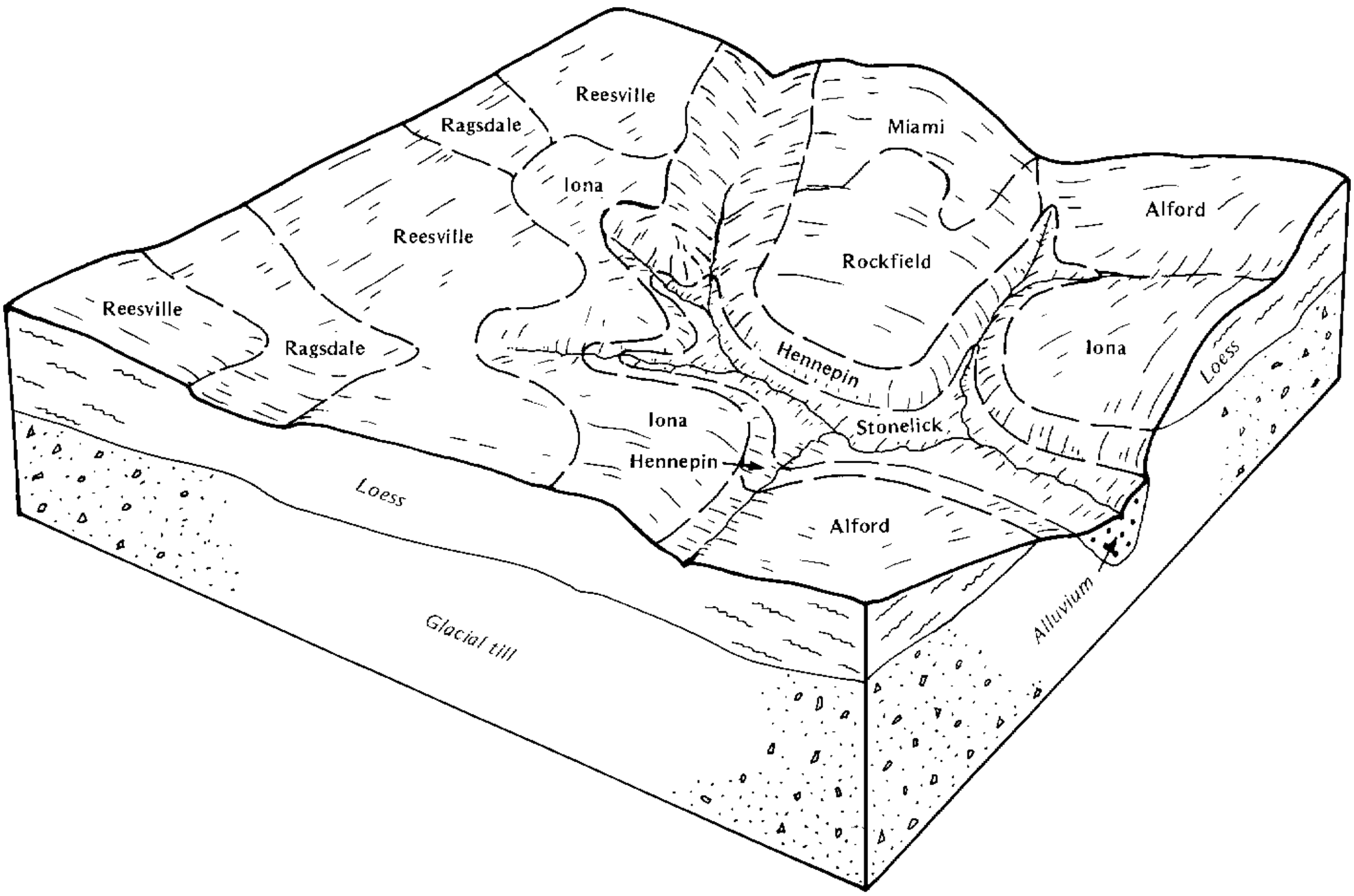

Figure 5.—Pattern of soils and parent material in the Reesville-Hennepin-Iona association.

This association is fairly well suited to cultivated crops. It is well suited to hay and pasture and to woodland. Erosion, runoff, and the slope are the main limitations.

This association is fairly well suited to building site development. It is poorly suited to local roads and streets and to sanitary facilities. The seasonal high water table, the shrink-swell potential, the slope, low strength, frost action, and moderately slow permeability are the main limitations.

Areas Dominated by Deep, Nearly Level to Very Steep Soils That Are Somewhat Poorly Drained to Well Drained; on Uplands

These soils are on an undulating to very steep landscape that has many swales, swells, and drainageways. The soils are used mainly for cultivated crops. The steeper soils are used as woodland. Excess water, erosion, runoff, and the slope are the main management concerns.

8. Reesville-Hennepin-Iona Association

Silty and loamy soils that are nearly level to very steep, and somewhat poorly drained to well drained; formed in loess and in glacial till; on ground moraines and till plain breaks

This association consists of soils on uplands. The landscape is undulating to very steep and has many ridges, deep depressions, and drainageways. The association makes up about 3 percent of the county. It is about 28 percent Reesville and similar soils, 19 percent Hennepin soils, 18 percent Iona soils, and 35 percent minor soils (fig. 5).

Reesville soils are nearly level and somewhat poorly drained. They are along and in drainageways, in flat, low areas, and on low rises. Typically, they have a surface layer of grayish brown silt loam. The subsoil is dark yellowish brown silty clay loam and light yellowish brown and olive yellow silt loam.

Hennepin soils are steep or very steep and are well drained. They are on the sides of draws and narrow drainageways. Typically, they have a surface layer of very dark grayish brown loam. The subsoil is brown loam.

Iona soils are nearly level or gently sloping and are moderately well drained. They are in broad areas along drainageways and on high rises, long side slopes, ridgetops, and knolls. Typically, they have a surface layer of yellowish brown silt loam mixed with dark yellowish brown silty clay loam from the subsoil. The subsoil is dark yellowish brown and yellowish brown silty clay loam and yellowish brown and light yellowish brown silt loam.

The minor soils in this association are the well drained Alford and moderately well drained Rockfield soils on slight rises, the well drained Miami soils on the more sloping breaks, the well drained Stonelick soils in drainageways, and the poorly drained Ragsdale soils downslope from the better drained soils.

The soils in this association are used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage that requires a drainage system has been drained. Many areas of the more sloping soils are used for hay or pasture or for woodland. The Reesville and Iona soils are well suited to cultivated crops and to hay and pasture. The Hennepin soils are generally unsuited to cultivated crops and hay and are poorly suited to pasture. The association is fairly well suited to woodland. Excess water, erosion, runoff, and the slope are the main limitations.

This association is poorly suited to buildings, local roads and streets, and sanitary facilities. The seasonal high water table, the slope, frost action, low strength, the shrink-swell potential, and moderately slow permeability are the main limitations.

Areas Dominated by Deep, Nearly Level to Moderately Steep Soils That Are Well Drained; on Terraces and Flood Plains

These soils are on nearly level flood plains, nearly level to rolling terraces, and moderately steep slopes between the terraces and the flood plains. They are used mainly for cultivated crops. Flooding, large stones, erosion, runoff, and droughtiness are the main management concerns.

9. Mudlavia-Armiesburg Variant-Martinsville-Ockley Association

Loamy and silty soils that are nearly level to moderately steep, and well drained; formed in gravelly outwash, in silty alluvium, in loamy outwash, and in silty sediments and loamy outwash; on terraces and flood plains

This association consists of soils on terraces and on the bottom land along streams and rivers. It is characterized by low relief on the bottom land, moderately steep slopes in areas between the bottom land and the terraces, and nearly level to rolling slopes on the terraces. The association makes up about 12 percent of the county. It is about 23 percent Mudlavia and similar soils, 17 percent Armiesburg Variant and similar soils, 14 percent Martinsville and similar soils, 14 percent Ockley and similar soils, and 32 percent minor soils.

Mudlavia soils are nearly level to moderately steep. They are on short side slopes, along drainageways, in broad areas, and on rises, knolls, and ridgetops on terraces. Typically, they have a surface layer of dark brown cobbly silt loam mixed with brown extremely gravelly clay from the subsoil. The subsoil is brown, strong brown, and dark brown extremely gravelly clay.

Armiesburg Variant soils are nearly level. They are on slight swells on flood plains. Typically, they have a surface layer of very dark grayish brown silty clay loam. The subsurface layer is very dark grayish brown and dark brown silty clay loam. The subsoil is dark brown and brown silty clay loam.

Martinsville soils are nearly level to moderately sloping. They are in broad areas, on rises, ridgetops, and knolls, and along narrow drainageways and side slopes near streams. Typically, they have a surface layer of dark brown loam mixed with yellowish brown loam from the subsoil. The subsoil is yellowish brown loam and strong brown clay loam and sandy clay loam.

Ockley soils are nearly level or gently sloping. They are in broad areas, along drainageways, and on rises, long side slopes, ridgetops, and knolls near streams. Typically, they have a surface layer of dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is yellowish brown silty clay loam, brown clay loam, and strong brown and dark brown gravelly sandy clay loam.

The minor soils in this association are the somewhat poorly drained Shadeland Variant soils in areas downslope from the better drained soils and the very poorly drained Beaucoup and Comfrey soils in depressional areas on flood plains.

The soils in this association are used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Some of the more sloping soils are used for hay, pasture, or woodland. Most of the association is well suited to cultivated crops, hay, and pasture. The Mudlavia soils, however, are fairly well suited or poorly suited to cultivated crops. Flooding, erosion, droughtiness, large stones, and runoff are the main limitations.

This association is well suited to woodland. Slope, erosion, and runoff are the main limitations.

Most of this association is fairly well suited to buildings, local roads and streets, and sanitary facilities. The Armiesburg Variant soils, however, are generally unsuited to these uses. Flooding, large stones, the slope, frost action, a poor filtering capacity, the shrink-swell potential, the seasonal high water table, low strength, moderate permeability, and a thin layer of suitable soil material are the main limitations.

Broad Land Use Considerations

The general soil map is useful in planning future changes in land use in Warren County, but it should not be used to select sites for specific structures. In general, the soils that are well suited to cultivated crops may not be well suited to urban development. The data on specific soils in the survey area can be helpful in planning future land use patterns.

The rate of urban development in the county is fairly low compared to that in other areas of Indiana. Only about 1,724 acres, or 1 percent of the survey area, is urban or built-up land. Each year, however, small areas in the county are developed for nonagricultural uses. As long as there is a demand for these uses, county and city officials should plan for orderly growth. The soil and water resources of the county should be considered in planning so that they provide the greatest benefit and enjoyment at the lowest cost.

Areas where the soils are so unfavorable that urban development is not desirable or is nearly prohibited are fairly extensive in Warren County. For part of the year, the water table is above or near the surface of some soils in the county. These soils are in the Drummer-Williamsport-Brenton, moderately fine substratum, association; the Sable-Ipava association; the Brenton, till substratum-Drummer association; and the Markham-Drummer-Williamsport association. They also are in many areas of the rest of the associations. The cost of lowering the water table enough to permit urban development is high.

The limitations affecting the use of the soils in the county as sites for septic tank absorption fields include the seasonal high water table, flooding, the slope, moderately slow permeability, and shallowness to bedrock. Onsite evaluation, extensive drainage systems, properly designed sanitary facilities, and careful selection of sites for buildings can help to overcome these limitations.

The soils that are limited as sites for urban development include the Markham soils in the Markham-Drummer-Williamsport association; the Barce and Montmorenci soils in the Drummer-Barce-Brenton, till substratum-Montmorenci association; the Rainsville, Williamstown, and Rockfield soils in the Rainsville-Williamstown-Rockfield-Starks association; the Cadiz and Morley soils in the Cadiz-Morley association; and the Mudlavia, Martinsville, and Ockley soils in the Mudlavia-Armiesburg Variant-Martinsville-Ockley association. The Armiesburg Variant soils are not suited to urban development because flooding is a severe hazard.

All the associations in Warren County are well suited or fairly well suited to cultivated crops, pasture, and hay. In most of the associations, the seasonal high water table is the main limitation. A drainage system can lower the water table. In the more sloping areas of all the associations, conservation practices are needed to reduce the runoff rate and to prevent excessive soil loss. With proper management practices and proper crop selection, all of the associations can produce good yields and provide excellent pasture.

The associations in Warren County are well suited or fairly well suited to woodland. The commercial production of timber is important on land parallel to the Wabash River. Trees generally achieve maximum growth on the better drained soils in the Rainsville-Williamstown-Rockfield-Starks, Cadiz-Morley, Reesville-Hennepin-Iona, and Mudlavia-Armiesburg Variant-Martinsville-Ockley associations. Applying good management and selecting suitable species for planting increase yields.

The Drummer-Williamsport-Brenton, moderately fine substratum, association, the Sable-Ipava association, the Brenton, till substratum-Drummer association, and the Markham-Drummer-Williamsport association are poorly suited to such intensive recreation uses as parks. The seasonal high water table, ponding, and moderately slow permeability are the major management concerns. A drainage system can lower the water table to some extent.

The rest of the associations are fairly well suited to intensive recreation uses. The main management concerns are the seasonal high water table, ponding, flooding, moderately slow permeability, erosion, stones on the surface, a thin surface layer, and the slope. These associations provide excellent nature study areas. In some areas potholes and flood plains provide excellent habitat for wildlife. If properly managed, these areas provide optimum wildlife habitat and recreational opportunities.

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, 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, Martinsville loam, 2 to 6 percent slopes, eroded, is a phase of the Martinsville 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. Landes-Chatterton complex, frequently flooded, 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, gravel, 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.

Some of the boundaries on the soil maps of Warren County do not match those on the soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. The differences are a result of improvements in the classification of soils, particularly modification or refinements in soil series concepts. Also, there may be differences in the intensity of mapping or in the extent of the soils within the survey area.

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

Soil Descriptions

AfB2—Alford silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is along drainageways and on rises, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 85 acres in size. The dominant size is about 30 acres.

Typically, the surface layer is brown silt loam mixed with yellowish brown silt loam from the subsoil. It is about 7 inches thick. The subsoil is about 59 inches thick. In sequence downward, it is yellowish brown, friable silt loam; brown, firm silty clay loam; and brown and yellowish brown, friable silt loam. The underlying material to a depth of about 80 inches is light yellowish brown silt. In some places the lower part of the subsoil has more sand. In other places the slope is less than 2 or more than 6 percent. In a few places the soil is moderately well drained. In a few areas the underlying material is loam glacial till. In many places the solum is less than 60 inches thick. In some areas the soil is more eroded. In a few areas the subsoil has less clay.

Included with this soil in mapping are some small areas of the somewhat poorly drained Reesville soils. These soils are in the lower lying, nearly level areas. A few areas of the well drained Hennepin soils are included on the steeper slopes. Hennepin soils have less silt and more sand than the Alford soil. Also included, in the slightly lower positions, are a few areas of somewhat poorly drained soils that are similar in texture to the Alford soil. The depth to carbonates in these soils is more than 60 inches. Included soils make up about 5 to 9 percent of the map unit.

The available water capacity of the Alford soil is high. Permeability is moderate. The content of organic matter in the surface layer is moderately low or moderate. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for hay, pasture, or woodland. Many small areas are used for cultivated crops.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Some conservation practices help to control erosion. These can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. They also include a permanent cover of vegetation. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion.

Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to the no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods during the summer months can help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

This soil is suitable as a site for septic tank absorption fields.

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

Am—Armiesburg Variant silty clay loam, frequently flooded. This deep, nearly level, well drained soil is on slight swells on flood plains. It is frequently flooded for very brief to long periods. Areas are elongated and are 5 to 400 acres in size. The dominant size is about 70 acres.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsurface layer is very dark grayish brown and dark brown silty clay loam about 13 inches thick. The subsoil is dark brown and brown, friable silty clay loam about 25 inches thick. The underlying material to a depth of about 60 inches is dark brown silty clay loam. In many places the surface soil is more than 24 inches thick. In some areas the solum has less clay, and in a few of these areas the surface soil is lighter colored. In a few places the soil is not calcareous throughout. In some areas the lower part of the subsoil is mottled.

Included with this soil in mapping are some small areas of the very poorly drained Beaucoup soils in depressions and some small areas of the well drained Jules and Stonelick soils in the higher positions. Jules and Stonelick soils have less clay in the subsoil than the Armiesburg Variant soil and have a lighter colored surface layer. Also included are a few small areas of the excessively drained Rodman soils on steep slopes and a few areas of somewhat poorly drained soils in sloughs. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Armiesburg Variant soil is high. Permeability is moderate. The content of organic matter in the surface layer is moderate. Runoff is slow or very slow. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content, but it becomes cloddy if it is tilled when wet.

Most areas of this soil are used for cultivated crops. A few areas are used for woodland.

This soil is well suited to corn and soybeans but is very poorly suited to winter wheat because of the flooding. Crusting is a problem. Floodwater can delay the planting of corn and soybeans. Replanting of these crops may be needed. Levees and upstream flood-control measures can reduce the hazard of flooding, but they are very expensive when constructed to achieve total protection. Working the soil at the correct moisture content can minimize compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall or flooding. These practices help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to spring plowing and chiseling.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. The flooding is a hazard. Shallow-rooted legumes that are tolerant of flooding grow best. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. The frequent flooding sometimes hinders harvesting and logging activities and the planting of seedlings. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods. Woodland management also involves excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Selection of alternative nearby building sites is suggested.

Flooding, frost action, and low strength severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent excessive wetness and the damage caused by frost action and improve the traffic-supporting capacity. Levees can help to control flooding. Conveying runoff to suitable outlets reduces the potential for frost action.

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

BbA—Barce silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on low rises and broad ridgetops in the uplands. Areas are generally irregular in shape and are 3 to 20 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark brown silt loam about 3 inches thick. The subsoil is about 43 inches thick. In sequence downward, it is dark yellowish brown, friable loam; brown, friable clay loam; strong brown, mottled, friable sandy clay loam; and light olive brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places, the slope is more than 2 percent and erosion is moderate. In a few areas the upper part of the subsoil has less clay and more sand. In some small areas the underlying material is at a depth of less than 40 or more than 60 inches. In many small areas the soil has less sand in the upper part of the subsoil and has a thinner solum. In a few places the surface layer is lighter colored or thinner. In a few areas the upper part of the underlying material is stratified and is sandy and loamy. In some areas the underlying material is silt loam glacial till.

Included with this soil in mapping are some small areas of the somewhat poorly drained Brenton and Gilboa soils. These soils are in the less sloping areas. Also included, in depressions, are a few small areas of the very poorly drained Peotone soils. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Barce soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 3 to 4 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content can minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. Some conservation practices help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. These include a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of this soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material is an alternative. The dwellings should be constructed without basements.

Frost action and the shrink-swell potential moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank can help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

The land capability classification is I. A woodland ordination symbol is not assigned.

BdB2—Barce-Montmorenci silt loams, 2 to 6 percent slopes, eroded. These deep, gently sloping, moderately well drained soils are along drainageways and on broad flats, rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 300 acres in size. The dominant size is about 55 acres. The unit is about 55 percent Barce soil and 35 percent Montmorenci soil. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

Typically, the surface layer of the Barce soil is very dark gray silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 10 inches thick. The subsoil is about 40 inches thick. In sequence downward, it is yellowish brown, friable silty clay loam and loam; dark brown, mottled, friable sandy clay loam; and yellowish brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In many small areas the subsoil has less sand and more silt. In places the slope is less than 2 or more than 6 percent. In a few areas the upper part of the subsoil has less clay and more sand. In many small areas the underlying material is within a depth of 40 inches, and in a few it is at a depth of more than 60 inches. In many small areas the soil has less sand in the upper part of the subsoil and has a thinner solum. In many places the surface layer is lighter colored or thinner. In a few areas the upper part of the underlying material is stratified and is sandy and loamy. In some areas the soil is more eroded. In a few areas silt loam glacial till is in the underlying material.

Typically, the surface layer of the Montmorenci soil is dark brown silt loam mixed with dark yellowish brown loam from the subsoil. It is about 8 inches thick. The subsoil is about 28 inches thick. In sequence downward, it is dark yellowish brown, friable loam; yellowish brown, friable clay loam; and yellowish brown, mottled, friable loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the slope is less than 2 or more than 6 percent. In some areas the soil has silt loam glacial till in the underlying material. In some small areas the underlying material is at a depth of less than 24 inches or more than 40 inches. In some places the surface layer is thicker. In other places the underlying material is stratified and is sandy and loamy. In a few areas the soil has a lighter colored surface layer. In some areas it is more eroded.

Included with these soils in mapping are some small areas of the somewhat poorly drained Brenton and Gilboa soils on the less sloping parts of the landscape. Also included are areas of the very poorly drained Milford and Peotone soils in depressions. Included soils make up about 10 percent of the map unit.

The available water capacity is high in the Barce soil and moderate in the Montmorenci soil. Permeability is moderate in the upper part of the solum in both soils and moderately slow in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is medium. From early winter to late spring, the Barce soil has a water table at a depth of 3 to 4 feet and the Montmorenci soil has one at a depth of 2 to 4 feet. The surface layer of both soils is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some small areas are used for hay or pasture.

These soils are well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Some conservation practices help to control erosion. These can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. They also include a permanent cover of vegetation. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soils at the correct moisture content helps to minimize compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soils are well suited to no-till and ridge-till cropping systems (fig. 6).

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits use of the Barce soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the Barce soil as a site for dwellings with basements and the Montmorenci soil as a site for dwellings without basements. The seasonal high water table severely limits the Montmorenci soil as a site for dwellings with basements. Foundations,

Figure 6.—No-till cropping in an area of Barce-Montmorenci silt loams, 2 to 6 percent slopes, eroded.

footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material is an alternative. The dwellings should be constructed without basements.

Frost action and the shrink-swell potential moderately limit the Barce soil as a site for local roads and streets, and low strength and the shrink-swell potential severely limit the Montmorenci soil. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

The moderately slow permeability and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

The land capability classification is IIe. A woodland ordination symbol is not assigned to these soils.

Be—Beaucoup silty clay loam, frequently flooded, undrained. This deep, nearly level, very poorly drained soil is on low bottom land and in old stream channels. It is frequently flooded for long periods. Areas are generally elongated, but some are irregular in shape. The areas are 3 to 35 acres in size. The dominant size is about 20 acres.

Typically, 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 34 inches thick. The upper part is dark gray and gray, mottled, firm silty clay loam, and the lower part is gray, mottled, firm silty clay loam that has thin strata of silt loam. The underlying material to a depth of about 60 inches is olive gray, mottled silt loam that has thin strata of loam. In places the slope is more than 2 percent. In many small areas the soil has less clay in the solum. In some areas, the surface soil is more than 24 inches thick and the soil has more sand throughout.

Included with this soil in mapping are some small areas of somewhat poorly drained soils on low rises. These soils have textures similar to those of the Beaucoup soil. Also included are some small areas of the well drained Armiesburg Variant and Piankeshaw Variant soils on the higher slopes on the edge of the map unit and a few small areas of the well drained Gosport soils on steep breaks. Included soils make up about 4 to 7 percent of the map unit.

The available water capacity of the Beaucoup soil is high. Permeability is moderately slow. The content of organic matter in the surface layer is high. Runoff is ponded to slow. The water table is at or above the surface from late winter to late spring. The surface layer becomes cloddy and hard to work if tilled when too wet. The clods harden as they dry and make seedbed preparation difficult.

Most areas of this soil are used as pasture, woodland, or wildlife habitat. Some small areas are used for cultivated crops.

This soil is generally unsuited to corn, soybeans, and small grain. Flooding and ponding are hazards, and a cold soil temperature and a scarcity of suitable drainage outlets are limitations. The root zone is shallow because of excess water. The ponding limits the use of equipment, and machinery even bogs down when the soil is wet. Puddling and crusting are problems.

This soil is generally unsuited to grasses and legumes for hay. It is poorly suited to pasture. If the soil is used for pasture, reed canarygrass and birdsfoot trefoil are the best suited forage species. Flooding and ponding are hazards. Frost heaving is a limitation. Shallow-rooted legumes that are tolerant of a seasonal high water table and flooding grow best. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. The use of equipment is limited during wet periods. The timber can be harvested during dry periods or when the soil is frozen. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after the stand is established. Planting containerized nursery stock or the larger seedlings can reduce the seedling mortality rate. Certain harvest methods leave some mature trees on the site to shade and protect seedlings. The seedlings survive and grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods. Selecting water-tolerant species for planting can reduce the windthrow hazard. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the flooding and the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site can be selected.

Flooding, low strength, and ponding severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water and improve the traffic-supporting capacity. Levees help to control flooding. Conveying runoff to suitable outlets can help to control ponding, remove excess water, and reduce the potential for frost action.

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

Bk—Beckville loam, occasionally flooded. This deep, nearly level, moderately well drained soil is on slight swales on flood plains. It is occasionally flooded for very brief periods. Areas are generally long and narrow and are 3 to 70 acres in size. The dominant size is about 40 acres.

Typically, the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil is about 26 inches thick. It is brown, friable loam in the upper part and brown, mottled, very friable sandy loam in the lower part. The underlying material to a depth of about 60 inches is brown and dark grayish brown, mottled sandy loam. In some places the subsoil has more clay. In some places the soil has a thicker, darker surface layer. In other places the surface layer and underlying material have more sand.

Included with this soil in mapping are a few small areas of the moderately well drained Morley soils. These soils are in the higher upland areas. They have more clay than the Beckville soil. Also included are some small areas of the well drained Stonelick soils in the higher positions nearer the streams and some small areas of the somewhat poorly drained Wakeland Variant soils on the lower parts of the landscape. Included soils make up about 10 to 15 percent of the map unit.

The available water capacity of the Beckville soil is moderate. Permeability is moderately rapid. The organic matter content is moderately low or moderate. Runoff is slow. The water table fluctuates between depths of 1.5 and 3.0 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops, and a few areas are used for pasture or hay.

This soil is well suited to corn and soybeans. It is poorly suited to fall-planted small grain because crop damage is severe during periods of flooding. The flooding is the main management concern. The crop damage or loss caused by floodwater can be reduced by planting short-season varieties of adapted crops. Late planting of crops also helps to prevent the crop damage or loss caused by flooding. Constructing dikes or water-retention structures can protect some areas from flooding. If a good surface drainage system is installed, longer season varieties of adapted crops can be grown.

Some management practices help to control erosion. These are crop rotations that include grasses and legumes, windbreaks, critical area planting, stripcropping, cover crops and green manure crops, a system of conservation tillage that leaves all or part of the crop residue on the surface, and a permanent cover of vegetation. Working the soil at the correct moisture content helps to minimize surface compaction and maintain good soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to fall plowing, fall chiseling, and no-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Flooding is the main management concern. Shallow-rooted legumes that are tolerant of a seasonal high water table and flooding grow best. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing reduces plant density and hardiness. Overgrazing and grazing during wet periods cause surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, pasture rotation, timely deferment of grazing, restricted use during wet periods, and timely applications of nutrients help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. In some years the occasional flooding and excessive wetness limit harvesting and logging activities and the planting of seedlings. Seedlings survive and grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Overcoming this hazard is generally not feasible. An alternative site should be selected.

Flooding and frost action severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, crowning the roads, constructing adequate roadside ditches, and installing culverts help to remove excess water and thus reduce the potential for frost action. Levees help to control flooding.

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

BmB2—Billett sandy loam, 1 to 4 percent slopes, eroded. This deep, nearly level or gently sloping, moderately well drained soil is on rises, ridgetops, and knolls. Areas are generally irregular in shape and are 3 to 25 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark grayish brown sandy loam mixed with dark yellowish brown sandy loam from the subsoil. It is about 8 inches thick. The subsoil is about 37 inches thick. It is dark yellowish brown, yellowish brown, and brown, friable sandy loam in the upper part and brown, mottled, very friable loamy sand in the lower part. The underlying material to a depth of about 60 inches is dark yellowish brown and yellowish brown, mottled sand that has thin lenses of dark brown loamy fine sand and loamy sand. In places the slope is less than 1 percent or more than 4 percent. In some small areas the underlying material is within a depth of 30 inches. In a few areas the soil has more clay in the subsoil. In some areas it has more gravel throughout. In a few places the surface layer is thicker. In some areas the soil is more eroded. In some places the surface layer is lighter colored. In other places the soil has glacial till in the lower part of the underlying material.

Included with this soil in mapping are some areas of the somewhat poorly drained La Hogue soils on the lower parts of the landscape. Also included are scattered areas of well drained, sandy soils that have strata of sandy loam or loamy sand. Included soils make up about 10 to 15 percent of the map unit.

The available water capacity of the Billett soil is moderate. Permeability is moderately rapid in the solum and rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is slow. The water table is at a depth of 3 to 6 feet from late fall to early spring. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

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

This soil is well suited to corn, soybeans, and small grain. The main management concerns are erosion, runoff, droughtiness, and soil blowing. Some management practices help to control erosion. These can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, drop structures, grade stabilization structures, or a combination of these. They also include a permanent cover of vegetation. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops helps to control erosion. Soil blowing can be controlled by windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, stripcropping, cover crops and green manure crops, and tillage methods that leave the surface rough. It also can be controlled by ridging at an angle to the prevailing wind or by establishing a permanent cover of vegetation.

Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion, runoff, and soil blowing are the main management concerns. Other concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion and soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is suitable as a site for dwellings without basements. The seasonal high water table moderately limits the use of this soil as a site for dwellings with basements. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material is an alternative. The dwellings should be constructed without basements.

Frost action moderately limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action.

A poor filtering capacity and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity can result in the pollution of ground water. Enlarging the absorption fields and installing deep wells can reduce the hazard of pollution. Installing perimeter drains around the absorption fields helps to lower the water table.

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

BnC2—Billett sandy loam, 6 to 12 percent slopes, eroded. This deep, moderately sloping, well drained soil is along narrow drainageways and on slight rises, ridgetops, and knolls. Areas are generally irregular in shape and are 3 to 10 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is dark brown sandy loam mixed with yellowish brown sandy loam from the subsoil. It is about 8 inches thick. The subsoil is about 34 inches thick. It is yellowish brown, strong brown, and brown, very friable sandy loam in the upper part and yellowish brown, very friable loamy sand in the lower part. The upper part of the underlying material is yellowish brown loamy sand that has strata of dark brown fine sand. The lower part to a depth of about 60 inches is light yellowish brown loamy fine sand that has strata of dark brown fine sand. In some places slopes are less than 6 percent or more than 12 percent. In other places the soil is moderately well drained. In a few areas the subsoil has more clay. In some areas the soil has more gravel throughout. In a few places the surface layer is lighter colored or is thicker. In some areas the soil is more eroded. In places it has glacial till in the lower part of the underlying material.

Included with this soil in mapping are some small areas of the somewhat poorly drained La Hogue soils on the lower parts of the landscape at the edges of the map unit. These soils make up about 10 to 15 percent of the map unit.

The available water capacity of the Billett soil is moderate. Permeability is moderately rapid in the solum and rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The surface layer is very friable and can be tilled throughout a fairly wide range in moisture content.

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

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and soil blowing are hazards. The conservation practices that help to control erosion are diversions, terraces, water- and sediment-control basins, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, crop rotations that include grasses and legumes, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Soil blowing can be controlled by windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, cover crops and green manure crops, or a permanent cover of vegetation. Ridging at an angle to the prevailing wind also helps to control soil blowing.

Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of manure help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and soil blowing are hazards. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion and soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Woodland management requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The slope moderately limits the use of this soil as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope.

Frost action and the slope moderately limit use of the soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action. Cutting and filling and constructing the roads on the contour help to overcome the slope.

A poor filtering capacity severely limits the use of this soil as a site for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity can result in the pollution of ground water. Enlarging the absorption field and installing deep wells can reduce the hazard of pollution.

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

BoA—Blount silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is in low areas, along and in drainageways, and on low rises in the uplands. Areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 60 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 33 inches thick. In sequence downward, it is light brownish gray, mottled, friable silt loam; yellowish brown, mottled, firm silty clay loam and silty clay; and light olive brown and light yellowish brown, mottled, firm silty clay loam and silt loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silt loam. In many small areas the soil has less sand and more silt in the solum. In some small areas the upper part of the subsoil has less clay and more sand. In places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of less than 22 inches or more than 45 inches. In a few areas the soil has a darker, thicker surface layer. In some small areas the upper part of the subsoil is less gray.

Included with this soil in mapping are a few small areas of the moderately well drained Cadiz and Morley soils. Also included are a few small areas of moderately well drained soils that have more sand and less clay in the subsoil than the Blount soil. Included soils are in the higher areas. They make up about 7 to 14 percent of the map unit.

The available water capacity of the Blount soil is high. Permeability is moderately slow. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 1 to 3 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some small areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table and crusting are limitations. The seasonal high water table hinders normal root growth and results in a shallow root zone. Surface drains, subsurface drains, or both help to lower the water table. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. The seasonal high water table is a limitation. Surface drains, subsurface drains, or both help to lower the water table. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are seedling mortality and the windthrow hazard. Planting special nursery stock and planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. The best suited timber species are those that have deep root systems. Carefully thinning the stands, using special equipment that does not damage the surficial root system, and applying harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed.

Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

The land capability classification is IIw. The woodland ordination symbol is 3C.

BpD2—Boyer-Mudlavia complex, 8 to 20 percent slopes, eroded. These deep, moderately sloping to moderately steep, well drained soils are along drainageways and on short side slopes. Areas are generally elongated and are 3 to 25 acres in size. The dominant size is about 20 acres. The unit is about 50 percent Boyer soil, 40 percent Mudlavia soil, and 10 percent other soils. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

Typically, the surface layer of the Boyer soil is brown gravelly sandy loam mixed with yellowish brown gravelly sandy loam from the subsoil. It is about 8 inches thick. The subsoil is about 27 inches thick. It is yellowish brown and strong brown, very friable gravelly sandy loam in the upper part and brown, firm gravelly sandy clay loam in the lower part. The underlying material to a depth of about 60 inches is yellowish brown very gravelly coarse sand. In places the slope is less than 8 percent or more than 20 percent. In a few areas the solum is less than 20 inches or more than 40 inches thick. In some areas the subsoil has less clay and more sand. In other areas the soil is more eroded. In a few areas the lower part of the underlying material is loam glacial till.

Typically, the surface layer of the Mudlavia soil is dark yellowish brown cobbly loam mixed with brown extremely gravelly clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 39 inches thick. In sequence downward, it is brown, friable extremely gravelly clay loam; strong brown, friable extremely gravelly and extremely cobbly clay; and dark brown, friable extremely gravelly clay. The underlying material to a depth of about 60 inches is pale brown extremely gravelly coarse sand. In places the slope is less than 8 percent or more than 20 percent. In a few areas the lower part of the underlying material is loam glacial till. In a few places the solum has a lower content of gravel and cobbles. In some areas the soil is more eroded. In a few areas the underlying material is at a depth of more than 72 inches or less than 40 inches.

Included with these soils in mapping are some small areas of the well drained Eldean, Ockley, Ormas, and Oshtemo soils on the less sloping flats. Eldean soils have more clay in the subsoil than the Boyer soil. Ockley soils have more clay than the Boyer soil and less clay than the Mudlavia soil. Ormas and Oshtemo soils have less clay than the Mudlavia soil and have a solum that is thicker than that of the Boyer soil. Ormas soils are on the lower terraces. Also included are a few small areas of severely eroded soils on the steeper slopes; a few small areas, in the slightly lower positions, of somewhat poorly drained soils that have textures similar to those of the Boyer and Mudlavia soils; and a few small areas of the excessively drained Rodman soils on the steeper slopes. Included soils make up about 10 percent of the map unit.

The available water capacity of the Boyer and Mudlavia soils is low. Permeability is moderately rapid in the solum of the Boyer soil and very rapid in the underlying material. It is moderate in the solum of the Mudlavia soil and very rapid in the underlying material. The content of organic matter in the surface layer of both soils is moderately low. Runoff is rapid. The surface layer of the Boyer soil is very friable, and that of the Mudlavia soil is friable.

Most areas of these soils are used for cultivated crops. Many small areas are used as hayland, pasture, or woodland.

These soils are generally unsuited to corn, soybeans, and small grain. Erosion and runoff are hazards. The gravel and cobblestones on the surface limit tillage and harvest operations. In summer the soils are droughty because of insufficient rainfall.

The Boyer soil is fairly well suited to grasses and legumes, such as bromegrass and alfalfa, for hay, but the Mudlavia soil is poorly suited. The Boyer soil is well suited to pasture, and the Mudlavia soil is fairly well suited. Erosion and runoff are hazards. In summer the soils are droughty because of insufficient rainfall. The main management concerns are the cobblestones and gravel on the surface, overgrazing, and grazing when the soils are too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer can help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

These soils are well suited to trees. Woodland management requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The slope of both soils and the shrink-swell potential and large stones in areas of the Mudlavia soil are moderate limitations on sites for dwellings. The stones can be excavated and replaced with suitable fill material. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material helps to prevent the damage caused by shrinking and swelling. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope.

The Boyer soil is moderately limited as a site for local roads and streets because of the slope, and the Mudlavia soil is severely limited because of the shrink-swell potential, the slope, and frost action. Cutting and filling and constructing the roads on the contour help to overcome the slope. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives minimize the damage caused by shrinking and swelling. Conveying runoff to a suitable outlet helps to protect the roads from frost action.

A poor filtering capacity severely limits the use of the Boyer soil as a site for septic tank absorption fields. Filling or mounding the absorption field with suitable material improves the capacity of the field to filter the effluent. The moderate permeability in the solum, the slope, and the large stones are moderate limitations affecting the use of the Mudlavia soil as a site for septic tank absorption fields. Enlarging the absorption field and using a holding tank help to compensate for the moderate permeability. Grading or land shaping can modify the slope, and the absorption field can be installed on the contour. The stones can be excavated, and then suitable fill material can be used as backfill.

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

BrA—Brenton silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats and low rises. Areas are generally irregular in shape and are 3 to 75 acres in size. The dominant size is about 40 acres.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer also is very dark gray silt loam. It is about 6 inches thick. The subsoil is about 38 inches thick. It is dark grayish brown and brown, mottled, friable silty clay loam in the upper part and dark yellowish brown and brown, mottled, friable loam in the lower part. The underlying material to a depth of about 60 inches is grayish brown, mottled silt loam that has thin strata of loamy sand and fine sandy loam. In places the lower part of the underlying material is glacial till. In a few areas the soil has more gravel in the lower part of the subsoil and in the underlying material. In some areas the underlying material is at a depth of more than 60 inches. In some places the subsoil has more sand. In other places, the slope is more than 2 percent and the soil is moderately eroded. In a few areas the soil has glacial till throughout the underlying material, and in some of these areas the subsoil has more clay.

Included with this soil in mapping are small areas of the moderately well drained Glenhall and Proctor soils on the more sloping parts of the landscape. Also included are a few depressional areas of the poorly drained Drummer soils. Included soils make up about 6 to 14 percent of the map unit.

The available water capacity of the Brenton soil is high. Permeability is moderate. The content of organic matter in the surface layer is high. Runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet in late winter and early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is the main limitation. Crusting is a problem. Tilling when the soil is at the proper moisture content minimizes surface compaction and maintains soil structure. A drainage system can help to lower the water table and raise the soil temperature earlier in spring, thus allowing the production of longer season varieties of adapted crops. Open ditches, surface drains, subsurface drains, or a combination of these can lower the water table. Cutbanks are unstable; therefore, caution is needed in operating heavy equipment near open excavations. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. The seasonal high water table and frost heaving are limitations. Water-tolerant grasses and legumes grow best. Because of the seasonal high water table, most deep-rooted legumes cannot be grown. A drainage system is necessary. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, pasture rotation in summer, timely deferment of grazing, and restricted use during wet periods minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

Because of the seasonal high water table, this soil is severely limited as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table. An alternative nearby site should be considered.

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

BsA—Brenton silt loam, till substratum, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats and low rises. Areas are mainly irregular in shape and are 3 to more than 500 acres in size. The dominant size is about 80 acres.

Typically, the surface soil is very dark gray silt loam about 15 inches thick. The subsoil is about 33 inches thick. In sequence downward, it is dark brown, mottled, friable silt loam and silty clay loam; brown, mottled, firm silty clay loam and silt loam; and brown, mottled, friable fine sandy loam. The upper part of the underlying material is grayish brown and brown, mottled fine sandy loam and sandy loam with lenses of loamy sand and loam. The lower part to a depth of about 60 inches is light olive brown, mottled loam. In places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of more than 60 inches. In places it has more sand and gravel. In a few areas the upper part of the underlying material is stratified sandy and loamy material. In a few places glacial till is throughout the underlying material. In some areas the soil has more sand in the subsoil. In a few areas the lower part of the underlying material is within a depth of 40 inches.

Included with this soil in mapping are small areas of the moderately well drained Barce, Glenhall, Montmorenci, and Proctor soils on the more sloping parts of the landscape. Also included are a few areas of the poorly drained Drummer soils in depressions. Included soils make up about 6 to 14 percent of the map unit.

The available water capacity of the Brenton soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderate or high. Runoff is slow. The water table is at a depth of 1 to 3 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is the main limitation. Crusting is a problem. Tilling when the soil at the proper moisture content can minimize surface compaction and maintain soil structure. A drainage system helps to lower the water table and raises the temperature of the soil earlier in spring, thus allowing the production of adapted crop varieties that have a longer growing season. Open ditches, surface or subsurface drains, or a combination of these can lower the water table. Cutbanks are unstable; therefore, caution is needed in operating heavy equipment near open excavations. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. The seasonal high water table and frost heaving are limitations. Water-tolerant grasses and legumes grow best. Because of the wetness, most deep-rooted legumes cannot be grown. A drainage system is necessary. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, pasture rotation in summer, timely deferment of grazing, and restricted use during wet periods minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

BwA—Brenton silt loam, moderately fine substratum, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats and low rises. Areas are mainly irregular in shape and are 3 to 75 acres in size. The dominant size is about 20 acres.

Typically, the surface soil is very dark grayish brown silt loam about 13 inches thick. The subsoil is about 33 inches thick. It is dark brown and dark yellowish brown, mottled, friable silty clay loam in the upper part and brown, mottled, friable fine sandy loam in the lower part. The upper part of the underlying material is yellowish brown, mottled fine sandy loam that has thin strata of loamy fine sand and loam. The lower part to a depth of about 60 inches is light olive brown, mottled silty clay loam. In places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of more than 60 inches. In some areas the upper part of the underlying material has more sand and gravel. In a few areas the underlying material is stratified sandy and loamy material throughout. In a few places the soil has more sand in the subsoil. In a few areas the underlying material is silt loam or silty clay loam glacial till throughout. In some areas the soil has more clay in the subsoil. In a few places the lower part of the underlying material is within a depth of 40 inches.

Included with this soil in mapping are some small areas of the moderately well drained Glenhall and Proctor soils on the more sloping parts of the landscape. Also included are a few areas of the poorly drained Drummer soils in depressions. Included soils make up about 6 to 14 percent of the map unit.

The available water capacity of the Brenton soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderate or high. Runoff is slow. The water table is at a depth of 1 to 3 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. It limits the depth of the root zone. Crusting is a problem. Surface drains, subsurface drains, or both help to lower the water table. Working the soil when it is at the correct moisture content can minimize surface compaction and maintain good soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops can help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent surface crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. The seasonal high water table and frost heaving are limitations. A drainage system is needed. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability in the underlying material and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

CaB2—Cadiz silt loam, moderately wet, 1 to 6 percent slopes, eroded. This deep, nearly level or gently sloping, moderately well drained soil is in broad areas along drainageways, on rises, along side slopes, on ridgetops, and on knolls in the uplands. Areas are generally irregular in shape and are 3 to more than 500 acres in size. The dominant size is about 80 acres.

In a typical profile, the surface layer is brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, friable silty clay loam in the upper part and light olive brown, mottled, firm silty clay loam and silt loam in the lower part. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silt loam. In places the slope is less than 1 percent or more than 6 percent. In a few areas the soil has more clay in the subsoil. In places it is severely eroded. In some places the surface layer is darker and thicker. In a few areas the upper part of the subsoil is grayer. In some areas the soil is more eroded. In a few places the soil has less silt and more sand in the upper part of the subsoil.

Included with this soil in mapping are some areas of the somewhat poorly drained Blount soils. These soils are in the less sloping areas. Also included are a few higher areas of well drained soils that have less clay and more sand in the upper part of the subsoil and a few areas of the well drained Hennepin soils on steep breaks. Included soils make up about 7 to 14 percent of the map unit.

The available water capacity of the Cadiz soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate or moderately low. Runoff is medium. The water table is at a depth of 2.5 to 6.0 feet from late fall to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards, and crusting is a problem. Some management practices help to control erosion. They can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer can help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table severely limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. An alternative is constructing the dwellings on raised, well compacted, suitable fill material. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

CbA—Camden silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is along drainageways and on broad flats, low rises, and ridgetops. Areas are generally irregular in shape and are 3 to 60 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 49 inches thick. In sequence downward, it is dark yellowish brown, friable silt loam; dark yellowish brown and yellowish brown, friable silty clay loam; and strong brown, friable loam. The underlying material to a depth of about 72 inches is yellowish brown sandy loam that has thin strata of loamy sand, loamy coarse sand, and loam. In a few areas the soil has glacial till in the lower part of the underlying material. In a few places the solum has more sand. In some areas the soil has more gravel in the lower part of the subsoil and in the underlying material. In places, the slope is more than 2 percent and the soil is moderately eroded.

Included with this soil in mapping are small areas of the somewhat poorly drained Millbrook and Starks soils in the lower positions. These soils make up about 3 to 7 percent of the map unit.

The available water capacity of the Camden soil is high. Permeability is moderate in the solum and moderate or moderately rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is slow. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Many areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the proper moisture content can minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to ridge-till and no-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, girdling, furrowing, and special harvest methods. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The soil is suitable as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

This soil is suitable as a site for septic tank absorption fields.

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

CbB2—Camden silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is along drainageways, in broad areas, and on rises, side slopes, ridgetops, and knolls. Areas are generally irregular in shape and are 3 to 75 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 46 inches thick. It is yellowish brown, friable silty clay loam in the upper part and yellowish brown, friable loam in the lower part. The underlying material to a depth of about 60 inches is yellowish brown sandy loam that has thin strata of loamy sand and sand. In a few areas glacial till is in the lower part of the underlying material. In a few places the solum has more sand. In some areas the soil has more gravel in the lower part of the subsoil and in the underlying material. In places the slope is less than 2 or more than 6 percent. In a few areas the soil is more eroded.

Included with this soil in mapping are small areas of the somewhat poorly drained Millbrook and Starks soils in the lower positions. These soils make up about 4 to 9 percent of the map unit.

The available water capacity of the Camden soil is high. Permeability is moderate in the solum and moderate or moderately rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and crusting are problems. Some management practices help to control erosion. They can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent surface crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till or ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion is a problem. Overgrazing and grazing when the soil is too wet are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer can help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings survive and grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, girdling, furrowing, and special harvest methods. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The soil is suitable as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying water to suitable outlets reduces the potential for frost action.

This soil is suitable as a site for septic tank absorption fields.

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

CdB2—Camden silt loam, till substratum, 2 to 6 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is along drainageways, in broad areas, and on rises, long side slopes, ridgetops, and knolls. Areas are generally irregular in shape and are 3 to 35 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 42 inches thick. It is yellowish brown, friable silty clay loam and loam in the upper part and yellowish brown, mottled, friable sandy loam in the lower part. The upper part of the underlying material is yellowish brown, mottled sandy loam that has thin strata of loamy sand and silt loam. The lower part to a depth of about 60 inches is light olive brown, mottled loam. In a few areas the soil has more sand in the solum. In places the slope is less than 2 percent or more than 6 percent. In a few areas the soil is more eroded. In some areas the subsoil and underlying material are not mottled.

Included with this soil in mapping are small areas of the somewhat poorly drained Millbrook and Starks soils in the lower positions on the landscape. These soils make up about 4 to 9 percent of the map unit.

The available water capacity of the Camden soil is high. Permeability is moderate in the solum and moderately slow in the underlying glacial till. The content of organic matter in the surface layer is moderately low. Runoff is medium. The water table is at a depth of 3.5 to 6.0 feet from late winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and crusting are problems. Some conservation practices help to control erosion. These can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Growing cover crops and green manure crops and applying a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal manure help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing when the soil is too wet are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings survive and grow well if plow planting, proper site preparation, spraying, cutting, girdling, furrowing, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The seasonal high water table moderately limits the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability in the lower part of the underlying material and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

CfA—Carmi loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on broad flats and low rises adjacent to the major streams. Areas are irregular in shape and are 3 to 110 acres in size. The dominant size is about 45 acres.

In a typical profile, the surface soil is very dark brown loam about 16 inches thick. The subsoil is about 29 inches thick. It is dark yellowish brown, friable gravelly sandy clay loam in the upper part and dark brown, friable and very friable gravelly loamy coarse sand in the lower part. The underlying material to a depth of about 60 inches is brown very gravelly coarse sand. In places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of more than 80 inches. In a few areas the subsoil has more clay. In a few places the soil has a lighter colored or thinner surface layer. In a few areas it has less clay in the subsoil or less gravel in the solum.

Included with this soil in mapping are some small areas of somewhat poorly drained soils in the slightly lower positions. These soils have textures similar to those of the Carmi soil. They make up about 4 to 7 percent of the map unit.

The available water capacity of the Carmi soil is moderate. Permeability is moderately rapid in the upper part of the subsoil and rapid in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Fall-seeded crops can make good use of the limited amount of available water.

Working the soil at the correct moisture content can minimize surface compaction and maintain soil structure. Growing cover crops and green manure crops and applying a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal manure help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to ridge-till and no-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is suitable as a site for dwellings. Frost action moderately limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action.

A poor filtering capacity severely limits the use of this soil as a site for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity can result in the pollution of ground water. Enlarging the absorption field and installing deep wells can reduce the hazard of pollution.

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

Cg—Comfrey loam, stratified substratum, rarely flooded. This deep, nearly level, very poorly drained soil is on low bottom land and in old stream channels. It is subject to flooding for very brief or brief periods. Areas are mainly elongated but can be irregular in shape. They are 3 to 275 acres in size. The dominant size is about 150 acres.

In a typical profile, the surface layer is black loam about 8 inches thick. The subsurface layer is about 23 inches of very dark brown loam and black, mottled loam. The subsoil is gray and grayish brown, mottled, friable loam about 17 inches thick. The underlying material to a depth of about 60 inches is light brownish gray, mottled loam that has thin strata of loamy fine sand and fine sandy loam. In places the slope is more than 2 percent. In some small areas the soil has less sand. In some areas the surface soil is less than 24 inches or more than 36 inches in thickness. In a few areas the soil has more gravel in the solum. In some small areas the underlying material is at a depth of less than 40 inches or more than 55 inches. In many areas the soil has more sand and gravel in the underlying material.

Included with this soil in mapping are some small areas of the somewhat poorly drained Lafayette soils in the higher positions. Also included are a few areas of the excessively drained Rodman soils on steep breaks and some small areas of the moderately well drained Waupecan soils on the higher parts of the landscape. Included soils make up about 3 to 6 percent of the map unit.

The available water capacity of the Comfrey soil is high. Permeability is moderate. The content of organic matter in the surface layer is high or very high. Runoff is ponded to slow. The water table is at or above the surface from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Flooding and ponding are hazards. A cold soil temperature and a scarcity of drainage outlets are problems. The seasonal high water table limits normal root growth and results in a shallow root zone. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting also are problems. Levees can help to control flooding. Surface drains, subsurface drains, pumps, or a combination of these can help to lower the water table. Small enclosed depressions can be drained by an open inlet pipe and subsurface drains. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. Flooding and ponding are hazards. Frost heaving is a problem. A drainage system is needed. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the flooding and the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

Because of frost action and ponding, this soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts can help to remove excess water and improve the traffic-supporting capacity. Conveying runoff to suitable outlets can reduce the hazard of ponding and the potential for frost action.

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

Cs—Comfrey loam, stratified substratum, frequently flooded, undrained. This deep, nearly level, very poorly drained soil is on low bottom land and in old stream channels. It is frequently flooded for very brief or brief periods. Areas are generally elongated or irregular in shape and are 3 to more than 400 acres in size. The dominant size is about 300 acres.

In a typical profile, the surface layer is black loam about 9 inches thick. The subsurface layer also is black loam. It is about 21 inches thick. It is mottled in the lower part. The subsoil is about 15 inches thick. It is dark gray, mottled, firm clay loam in the upper part and gray, mottled, firm sandy clay loam in the lower part. The underlying material to a depth of about 60 inches is gray, mottled silt loam that has thin strata of loamy sand and fine sandy loam. In places the slope is more than 2 percent. In many small areas the soil has less sand. In some areas the surface soil is less than 24 or more than 36 inches thick. In some small areas the underlying material is at a depth of less than 40 or more than 55 inches. In places the solum has more gravel. In a few areas bedrock is within a depth of 60 inches. In many areas the soil has more sand and gravel in the underlying material.

Included with this soil in mapping are some small areas of the somewhat poorly drained Lafayette soils in the higher positions. Also included are a few areas of the excessively drained Rodman soils on steep breaks and some small areas of the moderately well drained Waupecan soils in the higher positions. Included soils make up about 3 to 6 percent of the map unit.

The available water capacity of the Comfrey soil is high. Permeability is moderate. The content of organic matter in the surface layer is high or very high. Runoff is ponded to slow. The water table is at or above the surface from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used as pasture, woodland, or wildlife habitat. Some areas are used for cultivated crops.

This soil is generally unsuited to corn, soybeans, and small grain. Flooding and ponding are hazards. A cold soil temperature and a scarcity of drainage outlets are problems. The root zone is shallow because of excess water. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting also are problems.

This soil is generally unsuited to grasses and legumes for hay. It is poorly suited to pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. Flooding and ponding are hazards. Frost heaving is a problem. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Water-tolerant species, such as reed canarygrass and birdsfoot trefoil, are the best suited forage species. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the flooding and the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

Flooding, frost action, and ponding severely limit the use of this soil as a site for local roads and streets.

Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water and improve the traffic-supporting capacity. Levees help to control flooding. Conveying runoff to suitable outlets helps to control ponding, removes excess water, and reduces the potential for frost action.

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

CtB2—Corwin silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is in broad areas, along drainageways, and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas are mainly irregular in shape and are 3 to 50 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam mixed with dark yellowish brown silty clay loam from the subsoil. It is about 10 inches thick. The subsoil is about 28 inches thick. In sequence downward, it is dark yellowish brown, friable silty clay loam; dark yellowish brown and yellowish brown, mottled, friable clay loam; and brown, mottled, firm loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In a few places the subsoil has less sand and more silt. In some areas the slope is less than 2 percent or more than 6 percent. In a few small areas the underlying material is at a depth of less than 24 inches or more than 40 inches. In many small areas the soil has more sand in the upper part of the subsoil and has a thicker solum. In many places the surface layer is lighter colored or is thinner. In some areas the upper part of the underlying material is stratified and is sandy and loamy. In places the soil is more eroded.

Included with this soil in mapping are many small areas of the somewhat poorly drained Gilboa soils on the lower parts of the landscape. Also included are a few areas of moderately well drained, severely eroded soils on the steeper slopes. Included soils make up about 7 to 12 percent of the map unit.

The available water capacity of the Corwin soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is medium. The water table is at a depth of 2 to 4 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and crusting are problems. Some conservation practices help to control erosion. These can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain good soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal manure help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to ridge-till and no-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion is a problem. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential and the seasonal high water table moderately limit the use of this soil as a site for dwellings without basements. The seasonal high water table severely limits the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage.

Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

The shrink-swell potential, the seasonal high water table, and low strength moderately limit the use of this soil as a site for local roads and streets. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the wetness.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption field and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption field helps to lower the water table.

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

Cz—Cyclone silty clay loam. This deep, nearly level, poorly drained soil is in broad, low areas, in depressions, along and in narrow drainageways, and in swales on uplands. It is frequently ponded by runoff from the adjacent areas. Areas are mainly irregular in shape but can be long and narrow. They are 3 to 175 acres in size. The dominant size is about 85 acres.

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 41 inches thick. It is dark gray, mottled, firm silty clay loam in the upper part and yellowish brown, mottled, firm loam in the lower part. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In places the slope is more than 2 percent. In some small areas the underlying material is within a depth of 50 inches. In some areas it is stratified sandy and loamy material. In a few areas the surface soil is more than 24 inches thick. Many small areas have silt loam overwash from the adjacent slopes. In a few places the soil has more clay in the solum or underlying material.

Included with this soil in mapping are some small areas of the somewhat poorly drained Starks and moderately well drained Rainsville, Rockfield, Tuscola, and Williamstown soils on the higher, more sloping parts of the landscape. These soils make up about 7 to 12 percent of the map unit.

The available water capacity of the Cyclone soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is high. Runoff is ponded or very slow. The water table is at or above the surface from early winter to late spring. The surface layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Ponding is a hazard. A cold soil temperature and a scarcity of drainage outlets are limitations. The root zone is shallow because of wetness. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. Small enclosed depressions can be drained by an open inlet pipe and subsurface drains. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. Ponding is a hazard. Frost heaving is a problem. Overgrazing and grazing during wet periods are the major management concerns. A drainage system is necessary. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. The use of equipment is limited during wet periods. The timber harvest can be delayed until dry periods or until the soil is frozen. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Planting containerized nursery stock or planting larger trees can reduce the seedling mortality rate. Certain harvest methods leave some mature trees to shade and protect seedlings. The seedlings survive and grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Selecting water-tolerant species for planting can reduce the windthrow hazard. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

Frost action, low strength, and ponding severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by frost action and low strength, and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

Dw—Drummer silty clay loams. This map unit consists of deep, nearly level, poorly drained Drummer soils, some of which have a stratified, sandy substratum. The soils are frequently ponded by runoff from the adjacent areas. They are in broad, low areas, in depressions, along and in narrow drainageways, and in swales. Areas generally are irregular in shape but can be long and narrow. They are 3 to more than 500 acres in size. The dominant size is about 200 acres. This map unit is about 45 percent Drummer soil that has a stratified, sandy substratum and 55 percent other Drummer soils. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

In a typical profile, the surface layer of the dominant Drummer soil is black silty clay loam about 9 inches thick. The subsurface layer also is black silty clay loam. It is about 5 inches thick. The subsoil is about 36 inches thick. It is dark gray, grayish brown, and light olive gray, mottled, firm silty clay loam in the upper part and light brownish gray, mottled, friable silt loam in the lower part. The underlying material to a depth of about 60 inches is light brownish gray, mottled loam. In places the slope is more than 2 percent. In some small areas the underlying material is at a depth of less than 42 inches or more than 65 inches. In some areas the solum has more clay or more sand. A few areas have silt loam overwash from the adjacent slopes. In some places the surface layer is more than 24 inches thick. In other places the underlying material is loam or silt loam glacial till.

In a typical profile, the surface layer of Drummer soil that has a stratified, sandy substratum is black silty clay loam about 8 inches thick. The subsurface layer also is black silty clay loam. It is about 4 inches thick. The subsoil is about 33 inches thick. In sequence downward, it is dark gray, mottled, firm silty clay loam; light gray, mottled, firm silty clay loam and silt loam; and gray, mottled, friable silt loam. The upper part of the underlying material is gray, mottled sandy loam that has thin strata of loam. The lower part to a depth of about 60 inches is grayish brown coarse sandy loam that has common strata of loam and loamy coarse sand. In some places the subsoil has more sand and less silt. In other places the slope is more than 2 percent. In some small areas the underlying material is at a depth of less than 42 inches or more than 65 inches. In a few areas the solum has more clay. In places the underlying material is loam or silt loam glacial till. In some small areas the surface layer is more than 24 inches thick.

Included with these soils in mapping are some small areas of the somewhat poorly drained Brenton, Elliott, and Williamsport soils on low rises. Also included, on the higher parts of the landscape, are a few areas of the moderately well drained Markham and Proctor soils. Included soils make up about 6 to 10 percent of the map unit.

The available water capacity of both Drummer soils is high. Permeability generally is moderate. It is moderate or moderately rapid, however, in the sandy substratum. The content of organic matter in the surface layer of both soils is high. Runoff is ponded to slow. The water table is at or above the surface from late winter to late spring. The friable surface layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

Most areas of these soils are used for cultivated crops. Some areas are used for hay or pasture.

These soils are well suited to corn, soybeans, and small grain. Ponding is a hazard. A cold soil temperature and a scarcity of drainage outlets are problems. The seasonal high water table limits normal root growth and results in a shallow root zone. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can help to lower the water table. Small enclosed depressions can be drained by an open inlet pipe and subsurface drains. If drained, the soils can warm up earlier in spring. Working the soils at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and help to prevent crusting after periods of heavy rainfall. The soils are well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

These soils are well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. Ponding is a hazard. Frost heaving is a problem. Overgrazing and grazing during wet periods are the major management concerns. A drainage system is necessary. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the ponding, these soils are generally unsuitable as sites for dwellings and sanitary facilities. Alternative nearby sites should be considered.

Frost action, low strength, and ponding severely limit the use of these soils as sites for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to lower the water table, protect roads from frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

Dx—Drummer silty clay loam, gravelly substratum. This deep, nearly level, poorly drained soil is in broad, low depressional areas and in drainageways and swales. It is frequently ponded by runoff from the adjacent areas. Areas are mainly irregular in shape and are 3 to more than 500 acres in size. The dominant size is about 300 acres.

In a typical profile, the surface layer is very dark brown silty clay loam about 8 inches thick. The subsurface layer is very dark gray silty clay loam about 7 inches thick. The subsoil is about 46 inches thick. The upper part is dark gray, dark grayish brown, and grayish brown, mottled, friable silty clay loam, and the lower part is light brownish gray, mottled, friable loam that has thin strata of sandy loam. The underlying material to a depth of about 80 inches is brown very gravelly coarse sand. In places the slope is more than 2 percent. In a few places the lower part of the solum has more gravel. In many small areas the underlying material is at a depth of more than 65 inches. In a few areas the surface layer is more than 24 inches thick. In a few places the soil has more sand and less gravel in the underlying material. In some areas the solum has more sand.

Included with this soil in mapping are some small areas of the somewhat poorly drained Lafayette soils on the slightly higher parts of the landscape. These soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Drummer soil is high. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is high. Runoff is ponded to slow. The water table is at or above the surface from late winter to late spring. The friable surface layer becomes cloddy and hard to work if tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

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

This soil is well suited to corn, soybeans, and small grain. Ponding is a hazard. A cold soil temperature and a scarcity of drainage outlets are problems. The seasonal high water table limits normal root growth and results in a shallow root zone. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can help to lower the water table. An open inlet pipe and subsurface drains can be used in small enclosed depressions. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content can help to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Ponding is a hazard. Frost heaving is a problem. Overgrazing and grazing during wet periods are the major management concerns. A drainage system is necessary. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

Because of frost action, low strength, and ponding, this soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to lower the water table, prevent the damage caused by frost action, and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

Dy—Du Page loam, frequently flooded. This deep, nearly level, well drained soil is on swells on flood plains. It is frequently flooded for very brief to long periods. Areas are elongated and are 3 to 75 acres in size. The dominant size is about 30 acres.

In a typical profile, the surface layer is very dark grayish brown loam about 10 inches thick. The subsurface layer is dark brown loam about 16 inches thick. The subsoil is about 24 inches thick. It is dark brown, friable loam in the upper part and brown, friable silt loam in the lower part. The underlying material to a depth of about 60 inches is brown silt loam. In many areas the surface soil is less than 24 inches thick. In one of these areas, the solum has more clay. In some areas the soil has less clay throughout. In a few areas it is not calcareous throughout. In a few areas the lower part of the soil is mottled. In a few places the soil has strata of sand and loamy sand.

Included with this soil in mapping are some small areas of the well drained Stonelick and somewhat excessively drained Moundhaven soils on slight swells and natural levees. The surface layer of Stonelick soils is lighter in color than that of the Du Page soil. Also included, on nearly level terraces, are a few areas of the well drained Ormas soils. These soils have less clay in the upper part of the solum than the Du Page soil. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Du Page soil is high. Permeability is moderate. The content of organic matter in the surface layer is moderate or high. Runoff is slow or very slow. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as woodland, hayland, or pasture.

This soil is well suited to corn and soybeans. It is very poorly suited to winter wheat because of the flooding. Crusting is a problem. In some years later planting or replanting of corn and soybeans is needed because of the flooding. Planting short-season varieties of adapted crops is suggested. Levees and upstream flood-control measures can reduce the hazard of flooding, but providing total protection is extremely expensive. A surface drainage system is needed. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall or flooding. These measures help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant, shallow-rooted legumes grow best. The flooding is a hazard. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain plant density and hardiness, and keep the pasture in good condition.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Alternative nearby sites should be considered.

Flooding and low strength severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water and improve the traffic-supporting capacity. Levees help to control flooding.

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

EdB2—Eldean gravelly loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is along drainageways, in broad areas, and on rises, knolls, and ridgetops. Areas are mainly irregular in shape and are 3 to 325 acres in size. The dominant size is about 80 acres.

In a typical profile, the surface layer is brown gravelly loam mixed with dark yellowish brown gravelly clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 29 inches thick. In sequence downward, it is dark yellowish brown, friable gravelly clay loam; strong brown, firm gravelly clay; dark brown, firm very gravelly clay; and dark reddish brown, friable very gravelly clay loam. The underlying material to a depth of about 60 inches is pale brown extremely gravelly coarse sand. In places the slope is less than 2 percent or more than 6 percent. In some small areas the underlying material is at a depth of more than 40 inches. In a few areas the subsoil has less clay. In a few places the soil has a darker surface layer. In some areas it is underlain by sandstone or shale bedrock. In a few areas the solum has more gravel and cobbles. In a few places the soil is more eroded.

Included with this soil in mapping are small areas of somewhat poorly drained soils. These soils have textures similar to those of the Eldean soil. They are in the lower positions on the landscape. Also included, on the more sloping side slopes, are some small areas of the well drained Boyer and excessively drained Rodman soils. Boyer soils have less clay in the subsoil than the Eldean soil. Included soils make up about 5 to 12 percent of the map unit.

The available water capacity of the Eldean soil is moderate. Permeability is moderate or moderately slow in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is medium. The surface layer is friable.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. The content of gravel in the surface layer hinders tillage and harvest operations. Crusting is a problem. Some management practices help to control erosion. These can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. The content of gravel in the surface layer, overgrazing, and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer can help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings without basements. It is suitable as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Because of low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

A poor filtering capacity severely limits the use of this soil as a site for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity can result in the pollution of ground water. Enlarging the absorption fields and installing deep wells can reduce the hazard of pollution.

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

EgA—Eldean silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is along drainageways and on broad flats, on low rises, and on ridgetops. Areas are generally irregular in shape and are 3 to 100 acres in size. The dominant size is about 45 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 30 inches thick. In sequence downward, it is dark yellowish brown, friable silty clay loam; brown, firm gravelly clay; dark reddish brown, firm very gravelly clay; and dark brown, friable very gravelly clay loam. The underlying material to a depth of about 60 inches is brown extremely gravelly coarse sand. In places, the slope is more than 2 percent and the soil is moderately eroded. In many small areas the underlying material is at a depth of more than 40 inches. In a few areas the subsoil has less clay. In a few places the soil has a darker surface layer. In some areas it is underlain by sandstone or shale bedrock. In a few areas the solum has more gravel and cobbles.

Included with this soil in mapping are some small areas of somewhat poorly drained soils. These soils are similar in texture to the Eldean soil and are in the slightly lower positions. Also included, on the steeper parts of the landscape, are a few small areas of the well drained Boyer and excessively drained Rodman soils. Boyer soils have less clay in the solum than the Eldean soil. Included soils make up about 4 to 10 percent of the map unit.

The available water capacity of the Eldean soil is moderate. Permeability is moderate or moderately slow in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Insufficient rainfall causes droughtiness in summer. Crusting is a problem. Crops that are planted in fall or early spring can make good use of the limited amount of available water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal manure improve or help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow best. Insufficient rainfall causes droughtiness in summer. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods help to control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The soil is suitable as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

A poor filtering capacity severely limits the use of this soil as a site for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity can result in the pollution of ground water. Enlarging the absorption fields and installing deep wells can reduce the hazard of pollution.

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

EvA—Elston sandy loam, 0 to 3 percent slopes. This deep, nearly level or gently sloping, well drained soil is on broad flats and low rises adjacent to the major streams. Areas are irregular in shape and are 3 to 350 acres in size. The dominant size is about 45 acres.

In a typical profile, the surface layer is very dark brown sandy loam about 9 inches thick. The subsurface layer also is very dark brown sandy loam. It is about 10 inches thick. The subsoil is more than 61 inches thick. In sequence downward, it is dark yellowish brown, friable sandy loam; dark yellowish brown, very friable loamy sand; brown, very friable sand and dark yellowish brown, loose sand; and dark brown, very friable gravelly loamy sand. In places, the slope is more than 3 percent and the soil is moderately eroded. In a few areas the solum has more gravel. In a few areas the subsoil has more clay. In a few places the soil has a lighter colored or thinner surface layer. In a few areas the subsoil has less clay.

Included with this soil in mapping are some small areas of somewhat poorly drained soils. These soils have textures similar to those of the Elston soil. They are in the slightly lower positions. They make up about 4 to 7 percent of the map unit.

The available water capacity of the Elston soil is moderate. Permeability is moderately rapid in the upper part of the solum and very rapid in the lower part. The content of organic matter in the surface layer is moderate or high. Runoff is slow. The surface layer is very friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Soil blowing is a hazard. Insufficient rainfall causes droughtiness in summer. Soil blowing can be controlled by windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, stripcropping, cover crops and green manure crops, tillage methods that leave the surface rough, or a permanent cover of vegetation. Ridging at an angle to the prevailing wind also helps to control soil blowing. Fall-seeded crops can make good use of the limited amount of available water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow best. Soil blowing is a hazard. Insufficient rainfall in summer results in droughtiness. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is suitable as a site for dwellings and local roads and streets. Because of a poor filtering capacity, the soil is severely limited as a site for septic tank absorption fields. It readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity can result in the pollution of ground water. Enlarging the absorption fields and installing deep wells can reduce the hazard of pollution.

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

GgA—Gilboa silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is along and in drainageways, in flat, low areas, and on low rises. Areas generally are irregular in shape and are about 40 acres in size. They range from 3 to 170 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark brown silt loam about 4 inches thick. The subsoil is about 40 inches thick. In sequence downward, it is brown, mottled, friable silty clay loam; dark yellowish brown and dark grayish brown, mottled, friable clay loam; and 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 solum has less clay and more sand. In other places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of less than 40 inches or more than 60 inches. In a few areas the upper part of the underlying material is stratified and is sandy and loamy. In places the underlying material has less clay and more sand. In many small areas the subsoil has less sand.

Included with this soil in mapping are some small areas of the moderately well drained Barce, Corwin, and Montmorenci soils on the more sloping parts of the landscape. These soils make up about 10 to 13 percent of the map unit.

The available water capacity of the Gilboa soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate or high. Runoff is slow. The water table is at a depth of 1 to 3 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. The root zone is shallow because of the excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can lower the water table. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. The seasonal high water table and frost heaving are limitations. Surface drains, subsurface drains, or a combination of these can lower the water table. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the buildings on raised, well compacted, suitable fill material increases the depth to the water table.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and installing a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

GhB2—Glenhall silt loam, 1 to 4 percent slopes, eroded. This deep, nearly level or gently sloping, moderately well drained soil is along drainageways and on rises and knolls. Areas are mainly irregular in shape and are 3 to 35 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam mixed with dark yellowish brown clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 42 inches thick. In sequence downward, it is dark yellowish brown, friable clay loam and sandy clay loam; yellowish brown, mottled, friable loam; and strong brown, mottled, friable gravelly sandy loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled loamy sand that has strata of sand and silt loam. In some places the subsoil has less sand and more silt. In other places the slope is more than 4 percent. In some small areas the underlying material is at a depth of less than 40 inches or more than 60 inches. In many areas the subsoil has less clay. In a few areas the surface layer is thicker, and in some of these areas the subsoil has less sand and more silt. In some places the soil has less gravel. In other places the lower part of the underlying material has more clay.

Included with this soil in mapping are some small areas of the somewhat poorly drained Brenton and La Hogue soils on the lower parts of the landscape. These soils make up about 6 to 13 percent of the map unit.

The available water capacity of the Glenhall soil is high. Permeability is moderate in the solum and moderately rapid in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow or medium. The water table is at a depth of 2.5 to 3.5 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that help to control erosion can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Frost action severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity.

Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

GkB2—Glenhall silt loam, till substratum, 1 to 4 percent slopes, eroded. This deep, nearly level or gently sloping, moderately well drained soil is along drainageways and on rises and knolls. Areas are mainly irregular in shape and are 3 to 45 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam mixed with dark yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 38 inches thick. In sequence downward, it is dark yellowish brown, friable silty clay loam; yellowish brown, friable clay loam; and strong brown, mottled, friable gravelly sandy clay loam. The upper part of the underlying material is yellowish brown, mottled sand that has thin strata of loamy sand, fine sand, and loam. The lower part to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the slope is more than 4 percent. In some small areas the underlying material is at a depth of less than 40 inches or more than 60 inches. In many areas the subsoil has less clay. In a few areas the soil has a thicker surface layer, and in some of these areas the subsoil has less sand and more silt. In some places the soil has less gravel. In other places the lower part of the underlying material has more sand.

Included with this soil in mapping are some small areas of the somewhat poorly drained Brenton and La Hogue soils on the lower parts of the landscape. These soils make up about 8 to 15 percent of the map unit.

The available water capacity of the Glenhall soil is high. Permeability is moderate in the solum and moderately slow in the underlying glacial till. The content of organic matter in the surface layer is moderate. Runoff is slow or medium. The water table is at a depth of 2.5 to 3.5 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Some management practices help to control erosion. These can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste improve or help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and till-plant cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets.

Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

GoF—Gosport shaly silt loam, 25 to 40 percent slopes. This moderately deep, steep or very steep, moderately well drained soil is on the sides of draws and along narrow drainageways. Areas are mainly elongated, but they can be irregular in shape. They are 5 to 70 acres in size. The dominant size is about 50 acres.

In a typical profile, the surface layer is very dark grayish brown shaly silt loam about 4 inches thick. The subsoil is about 20 inches of light yellowish brown, friable shaly silty clay loam. The underlying material extends to a depth of about 30 inches. It is light olive brown shaly silty clay loam. Below this is partly weathered, thinly bedded shale that grades to unweathered shale at a depth of 33 inches. In some areas the bedrock is not within a depth of 40 inches. In a few areas the soil has less clay in the solum. In places the slope is less than 25 percent. In a few areas the subsoil formed in glacial drift, and in some of these areas the soil has glacial till in the underlying material. In a few places the solum formed in sandstone residuum and contains more sand and less clay throughout.

Included with this soil in mapping are some areas of the moderately well drained High Gap Variant, well drained Mudlavia, and somewhat poorly drained Shadeland Variant soils on the less sloping parts of the landscape near the more sloping breaks. High Gap Variant soils have less clay in the subsoil than the Gosport soil. Also included are a few areas of the well drained Piankeshaw Variant and very poorly drained Beaucoup soils on flood plains at the base of breaks and areas of soils that have bedrock near or above the surface. Included soils make up about 10 percent of the map unit.

The available water capacity of the Gosport soil is low. Permeability is slow. The content of organic matter in the surface layer is moderately low. Runoff is rapid or very rapid. The surface layer is friable.

Most areas of this soil are used as woodland. Some areas are used for hay or pasture.

This soil is generally unsuited to corn, soybeans, and small grain. Erosion and runoff are hazards. The slope is the major limitation.

This soil is generally unsuited to grasses and legumes for hay and is poorly suited to pasture. Bromegrass and alfalfa are the best suited forage species. Erosion and runoff are hazards. Operating some types of equipment on the steeper slopes can be hazardous. Insufficient rainfall in summer results in droughtiness. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of drought-resistant grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is poorly suited to trees. The main management concerns are the erosion hazard, the equipment limitation, seedling mortality, and the windthrow hazard. Logging roads, skid trails, and landings should be located on gentle grades. Water bars, out-sloping road surfaces, culverts, and drop structures can help to remove water. Special logging methods, such as yarding the logs uphill with a cable, may be needed to minimize the use of crawler tractors and rubber-tired skidders. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the shrink-swell potential and the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities.

The slope, low strength, and the shrink-swell potential severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material and strengthening or replacing the base material improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling. Cutting and filling and constructing the roads on the contour help to overcome the slope.

The land capability classification is VIIe. The woodland ordination symbol is 2R.

HeG—Hennepin loam, 30 to 70 percent slopes. This deep, steep or very steep, well drained soil is on the sides of draws and along narrow drainageways. Areas are generally elongated but can be irregular in shape. They are 3 to 300 acres in size. The dominant size is about 100 acres.

In a typical profile, the surface layer is very dark grayish brown loam about 3 inches thick. The subsoil is brown, firm loam about 10 inches thick. The underlying material to a depth of about 60 inches is brown loam. In many areas the solum is more than 20 inches thick. In most of these areas, the subsoil has more clay. In many areas, the upper part of the subsoil has more clay and the solum is less than 24 inches thick. In some areas the subsoil has more silt and less sand, and in a few of these areas glacial till is at a depth of more than 60 inches. In many areas on the upper part of the slopes, the subsoil has more sand. In places the soil has pink underlying material.

Included with this soil in mapping are some areas of the well drained Alford and moderately well drained Cadiz, Morley, and Rainsville soils on the more nearly level ridgetops; small areas of the well drained Stonelick soils in drainageways; and, on toe slopes and the bottom of draws, areas where bedrock is within a depth of 40 inches. Alford soils have more silt and less sand in the subsoil than the Hennepin soil. Stonelick soils have less clay than the Hennepin soil. Also included, in the upper end of drainageways, are some areas of soils that have slopes of less than 25 percent. Included soils make up about 15 percent of the map unit.

The available water capacity of the Hennepin soil is moderate. Permeability is moderately slow. The content of organic matter in the surface layer is moderate or high. Runoff is rapid or very rapid. The surface layer is friable.

Most areas of this soil are used as woodland. Some areas are used for hay or pasture.

This soil is generally unsuited to corn, soybeans, and small grain. Erosion and runoff are hazards. The slope is a major limitation.

This soil is generally unsuited to grasses and legumes for hay and is poorly suited to pasture. Orchardgrass and alfalfa are the best suited forage species. Erosion and runoff are hazards. Operating equipment is hazardous on the steeper slopes. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is poorly suited to trees. The main management concerns are the erosion hazard, the equipment limitation, and plant competition. Logging roads, skid trails, and landings should be located on gentle grades. Water bars, out-sloping road surfaces, culverts, and drop structures can help to remove water. Special logging methods, such as yarding the logs uphill with a cable, may be needed to minimize the use of crawler tractors and rubber-tired skidders. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities. The slope severely limits the use of the soil as a site for local roads and streets. Cutting and filling and constructing the roads on the contour help to overcome the slope.

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

HfB—High Gap silt loam, 2 to 9 percent slopes, stony. This moderately deep, gently sloping or moderately sloping, well drained soil is on slight rises, ridgetops, and knolls. A few stones 10 to 20 inches in diameter are on the surface. Areas are generally irregular in shape and are 3 to 100 acres in size. The dominant size is about 40 acres.

In a typical profile, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is about 29 inches thick. In sequence downward, it is dark brown and yellowish brown, friable silt loam; yellowish brown, friable silty clay loam; and yellowish brown, friable sandy clay loam. Yellowish brown, weathered sandstone that crushes easily to sandy loam is between depths of 34 and 36 inches. Below this is partly weathered sandstone that grades to hard, unweathered sandstone bedrock at a depth of about 38 inches. In some places the soil does not have bedrock within a depth of 40 inches. In other places the slope is less than 2 percent or more than 9 percent. In some areas the soil is moderately eroded. In a few areas the subsoil has less clay. In places glacial till is in the upper part of the underlying material. In a few areas the solum formed in glacial outwash over shale residuum.

Included with this soil in mapping are small areas of the somewhat poorly drained Shadeland Variant soils in the lower positions on the landscape and some areas where bedrock is within a depth of 20 inches. Also included are a few areas of Weikert Variant soils on steep slopes at the edge of the map unit and some severely eroded areas on the steeper nose slopes and sharp slope breaks. Weikert Variant soils have less clay in the solum than the High Gap soil. Included soils make up about 11 percent of the map unit.

The available water capacity of the High Gap soil is moderate. Permeability also is moderate. The content of organic matter in the surface layer is moderately low or moderate. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Large stones on the surface hinder tillage and harvesting operations. Some management practices help to control erosion. They are crop rotations that include grasses and legumes, drop structures, diversions, contour farming, stripcropping, cover crops and green manure crops, grade stabilization structures, and a system of conservation tillage that leaves all or part of the crop residue on the surface. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Tilling when the soil is at the proper moisture content can minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent surface crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concern is the windthrow hazard. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The depth to bedrock moderately limits the use of this soil as a site for dwellings without basements and severely limits the use of the soil as a site for dwellings with basements. It limits the construction of basements. Measures that can overcome this limitation generally are prohibitively expensive.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

A thin layer of suitable soil material and seepage of effluent through the bedrock severely limit the use of this soil as a site for septic tank absorption fields. The amount of soil material available to filter the liquid waste is limited. The bedrock does not adequately filter the effluent. Consequently, ground water may be polluted.

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

HhB2—High Gap Variant loam, 2 to 6 percent slopes, eroded. This moderately deep, gently sloping, moderately well drained soil is on slight rises, ridgetops, and knolls. Areas are generally irregular in shape and are 3 to 60 acres in size. The dominant size is about 35 acres.

In a typical profile, the surface layer is brown loam mixed with yellowish brown clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 23 inches thick. It is yellowish brown and friable. It is clay loam in the upper part and mottled clay loam and sandy clay loam in the lower part. The underlying material extends to a depth of about 36 inches. It is light yellowish brown, mottled very shaly silty clay. Below this is partly weathered, thinly bedded shale that grades to unweathered shale at a depth of about 39 inches. In places the soil does not have bedrock within a depth of 40 inches. In a few areas the subsoil has more clay. In some areas the slope is less than 2 percent or more than 6 percent. In other areas the soil is more eroded. In places the subsoil has less sand and more silt. In a few areas the soil has glacial till in the underlying material.

Included with this soil in mapping are small areas of the somewhat poorly drained Shadeland Variant soils on the less sloping parts of the landscape, some areas where bedrock is within 20 inches of the surface, and a few areas of the well drained Gosport soils on steep breaks. Also included, on flood plains at the base of upland slopes, are a few areas of the well drained Piankeshaw Variant soils. Included soils make up about 10 percent of the map unit.

The available water capacity of the High Gap Variant soil is moderate. Permeability is moderately slow or slow. The content of organic matter in the surface layer is moderately low or moderate. Runoff is medium. The water table is at a depth of 2.0 to 3.5 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Some management practices that help to control erosion are crop rotations that include grasses and legumes, diversions, contour farming, stripcropping, cover crops and green manure crops, grade stabilization structures, and a conservation tillage system that leaves all or part of the crop residue on the surface. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Tilling the soil at the proper moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table and the shrink-swell potential moderately limit the use of this soil as a site for dwellings without basements. The seasonal high water table severely limits the use of the soil as a site for dwellings with basements. The soft bedrock can be excavated. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

A thin layer of suitable soil material and seepage of effluent through the bedrock severely limit the use of this soil as a site for septic tank absorption fields. The amount of soil material available to filter liquid waste is limited. The bedrock does not adequately filter the effluent. Consequently, ground water may be polluted. An alternative nearby site should be considered.

The land capability classification is IIe. The woodland ordination symbol is 6A.

HhC2—High Gap Variant loam, 6 to 12 percent slopes, eroded. This moderately sloping, moderately well drained soil is on rises, ridgetops, and knolls in the uplands. Areas are generally irregular in shape and are 3 to 55 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is brown loam mixed with dark yellowish brown clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 21 inches thick. It is dark yellowish brown, friable clay loam in the upper part and yellowish brown, mottled, friable clay loam and loam in the lower part. The underlying material extends to a depth of about 34 inches. It is light olive brown, mottled shaly silty clay. Below this is partly weathered, thinly bedded shale that grades to unweathered shale at a depth of about 37 inches. In places the soil does not have bedrock within a depth of 40 inches. In a few areas the subsoil has more clay. In some areas the slope is less than 6 percent or more than 12 percent. In other areas the soil is more eroded. In some places the subsoil has less clay and sand and more silt. In a few areas the soil has glacial till in the underlying material.

Included with this soil in mapping are small areas of the somewhat poorly drained Shadeland Variant soils on the less sloping parts of the landscape, some areas where bedrock is within 20 inches of the surface, and a few areas of the well drained Gosport soils on steep breaks. Also included, on flood plains at the base of upland slopes, are a few areas of the well drained Piankeshaw Variant soils. Included soils make up about 8 percent of the map unit.

The available water capacity of the High Gap Variant soil is moderate. Permeability is moderately slow or slow. The content of organic matter in the surface layer is moderately low or moderate. Runoff is medium. The water table is at a depth of 2.0 to 3.5 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Management practices that help to control erosion are crop rotations that include grasses and legumes, drop structures, diversions, contour farming, stripcropping, cover crops and green manure crops, grade stabilization structures, and a system of conservation tillage that leaves all or part of the crop residue on the surface. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Tilling when the soil is at the proper moisture content can minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent surface crusting after periods of heavy rainfall. These measures and applications of animal waste maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table and the shrink-swell potential moderately limit the use of this soil as a site for dwellings without basements. The seasonal high water table severely limits the use of the soil as a site for dwellings with basements. The soft bedrock can be excavated. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted fill material is an alternative. Designing the dwellings so that they conform to the natural slope of the land minimizes the amount of cutting and filling that is needed and the hazard of hillside slippage. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope. The dwellings should be constructed without basements.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

A thin layer of suitable soil material and seepage of effluent through the bedrock severely limit the use of this soil as a site for septic tank absorption fields. The thin layer of soil material and the bedrock do not adequately filter the effluent. Consequently, ground water may be polluted.

The land capability classification is IIIe. The woodland ordination symbol is 6A.

Hm—Houghton muck, drained. This deep, nearly level, very poorly drained soil is along and in narrow drainageways, in flat, low areas, in depressions, and in swales. It is frequently ponded by runoff from the adjacent areas. Areas generally are irregular in shape and are about 10 acres in size. They range from about 5 to 60 acres in size.

In a typical profile, the surface layer is black muck about 9 inches thick. The organic material below this layer extends to a depth of about 60 inches or more. In sequence downward, it is very dark brown, friable muck; very dark grayish brown and dark brown, firm muck; and very dark brown, friable muck. In places the slope is more than 2 percent. In many small areas sandy material, loamy material, coprogenous earth, marl, or a mixture of these is at a depth of 16 to 50 inches.

Included with this soil in mapping are some small areas of the very poorly drained Peotone, Wallkill Variant, and Warners Variant and poorly drained Drummer soils on the slightly higher parts of the landscape. Also included are a few scattered areas of undrained Houghton soils throughout the map unit. Included soils make up about 5 to 8 percent of the map unit.

The available water capacity of the Houghton soil is very high. Permeability is moderately slow to moderately rapid. The content of organic matter in the surface layer is very high. Runoff is ponded or very slow. The water table is at or above the surface from early fall to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

In most areas this soil is used for cultivated crops. It is fairly well suited to corn and soybeans. Soil blowing, ponding, and burning of the organic material are hazards. A cold soil temperature, the difficulty in finding drainage outlets, and subsidence of the organic material after drainage are limitations. Excess water hinders normal root growth and results in a shallow root zone. The ponding limits the use of equipment, and machinery can bog down when the soil is wet. Managing the water table prevents oxidation of the muck. Overdrainage can increase the rate of oxidation. Also, the muck may be unstable. The conservation practices that help to control soil blowing are windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, and a permanent cover of vegetation. Ridging at an angle to the prevailing wind also helps to control soil blowing. If suitable drainage outlets are available, surface drains, subsurface drains, pumps, or a combination of these can remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. If drained, the soil can warm up early in spring. A drainage system improves the stability of the muck. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. The soil is well suited to spring plowing.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Soil blowing, ponding, and burning of the organic material are hazards. Frost heaving, the difficulty in finding drainage outlets, and subsidence of the organic material after drainage are limitations. The muck may be unstable. The ponding limits the use of equipment, and machinery can bog down when the soil is wet. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in reduced forage yields, damage to the sod, and reduced plant density and hardiness. Managing the water table protects the muck from oxidation. Overdrainage can increase the rate of oxidation. If suitable drainage outlets are available, surface drains, subsurface drains, pumps, or a combination of these can remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. A drainage system improves the stability of the muck.

Proper stocking rates, timely deferment of grazing, and restricted use during wet periods maintain good plant density and hardiness and keep the pasture in good condition.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. The use of equipment is limited during wet periods. Timber harvest should be delayed until dry periods or until the soil is frozen. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Planting containerized nursery stock or the larger seedlings can reduce the seedling mortality rate. Certain harvest methods leave some mature trees to provide shade and protection for seedlings. The windthrow hazard can be reduced by harvest methods that do not isolate the remaining trees or leave them widely spaced. Seedlings survive and grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities.

Frost action, subsidence, and ponding severely limit the use of this soil as a site for local roads. Removing the unstable material and constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by frost action, improve the traffic-supporting capacity, and control subsidence. The use of pilings is an alternative. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

Ho—Houghton muck, undrained. This deep, nearly level, very poorly drained soil is along and in narrow drainageways, in flat, low areas, in depressions, and in swales. It is frequently ponded by runoff from the adjacent areas. Areas are generally irregular in shape and are 3 to 90 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is very dark brown muck about 10 inches thick. Below this to a depth of about 60 inches is very dark brown, black, dark brown, and very dark grayish brown, friable muck. In places the slope is more than 2 percent. In many small areas sandy material, loamy material, marl, coprogenous earth, or a mixture of these is at a depth of 16 to 50 inches.

Included with this soil in mapping are some small areas of the very poorly drained Peotone, Wallkill Variant, and Warners Variant soils and the poorly drained Drummer soils on the slightly higher parts of the landscape. These soils do not have as much organic material as the Houghton soil. Also included are a few areas of somewhat poorly drained soils on slight rises, mainly at the edge of the map unit. Included soils make up about 5 to 9 percent of the map unit.

The available water capacity of the Houghton soil is very high. Permeability is moderately slow to moderately rapid. The content of organic matter in the surface layer is very high. Runoff is ponded or very slow. The water table is at or above the surface from early fall to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used as wildlife habitat. Some areas are used for cultivated crops.

This soil is generally unsuited to corn and soybeans. Soil blowing, ponding, and burning of the organic material are hazards.

This soil is well suited to grasses and legumes for hay. It is poorly suited to pasture. Canarygrass and birdsfoot trefoil grow well in pastured areas. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Soil blowing, ponding, and burning of the organic material are hazards. Frost heaving and subsidence of the muck after drainage are limitations. Suitable drainage outlets are not readily available. The ponding limits the use of equipment, and machinery can bog down when the soil is wet. The muck may be unstable. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control soil blowing. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods maintain good plant density and hardiness and help to keep the pasture in good condition.

This soil is poorly suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. The seasonal high water table limits the use of equipment during wet periods. The timber harvest should be delayed until dry periods or until the soil is frozen. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Planting containerized nursery stock or the larger seedlings can reduce the seedling mortality rate. Certain harvest methods leave some mature trees to provide shade and protect seedlings. Selecting water-tolerant species for planting reduces the windthrow hazard. Seedlings survive and grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

Frost action, subsidence, and ponding severely limit the use of this soil as a site for local roads. Removing the unstable material and constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by frost action, improve the traffic-supporting capacity, and help to control subsidence. The use of pilings is an alternative. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

IoB2—Iona silt loam, 1 to 4 percent slopes, eroded. This deep, nearly level or gently sloping, moderately well drained soil is in broad areas, along drainageways, on high rises, along side slopes, and on ridgetops and knolls in the uplands. Areas generally are irregular in shape and are about 20 acres in size. They range from 3 to 70 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam mixed with dark yellowish brown silty clay loam from the subsoil. It is about 9 inches thick. The subsoil is about 46 inches thick. In sequence downward, it is dark yellowish brown, firm silty clay loam; yellowish brown, mottled, firm silty clay loam; and yellowish brown and light yellowish brown, mottled, friable silt loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silt loam. In some places the subsoil has more sand and less silt. In other places the slope is less than 1 percent or more than 4 percent. In some areas the soil has glacial till in the underlying material. In other areas the surface layer is darker. In a few areas the upper part of the subsoil does not have gray mottles. In places the soil is more eroded.

Included with this soil in mapping are some areas of the somewhat poorly drained Ipava and Reesville soils on the slightly lower parts of the landscape. Also included are a few areas of the very poorly drained Ragsdale soils in depressions. Included soils make up about 6 to 12 percent of the map unit.

The available water capacity of the Iona soil is high. Permeability is moderate. The content of organic matter in the surface layer is moderate or moderately low. Runoff is slow or medium. The water table is at a depth of 2.0 to 3.5 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Management practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the seasonal high water table moderately limit the use of this soil as a site for dwellings without basements. The seasonal high water table severely limits the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

IpA—Ipava silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on large flats and slight rises in the uplands. Areas are generally long and wide or irregular in shape and are 3 to 175 acres in size. The dominant size is about 50 acres.

In a typical profile, the surface layer is black silt loam about 8 inches thick. The subsurface layer is black silty clay loam about 4 inches thick. The subsoil is about 25 inches thick. In sequence downward, it is pale brown, mottled, firm silty clay; grayish brown and light brownish gray, mottled, firm silty clay loam; and light yellowish brown, mottled, friable silt loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silt loam. In some places the subsoil has less clay. In other places the slope is more than 2 percent. In some areas silt loam or loam glacial till is within a depth of 60 inches.

Included with this soil in mapping are small areas of the poorly drained Sable soils in the lower swales. Also included are a few areas of the moderately well drained Iona soils on the lower parts of the landscape. Included soils make up about 5 to 14 percent of the map unit.

The available water capacity of the Ipava soil is high. Permeability is moderately slow. The content of organic matter in the surface layer is high. Runoff is slow. The water table is at a depth of 1 to 3 feet from late winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. The root zone is shallow because of excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can remove excess water. Working the soil at the correct moisture content minimizes surface compaction and helps to maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. The seasonal high water table and frost heaving are limitations. Surface drains, subsurface drains, or a combination of these can remove excess water. Overgrazing or grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential and the seasonal high water table severely limit the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Frost action, low strength, and the shrink-swell potential severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action. Crowning the roads, which improves drainage, and providing soil additives minimize the damage caused by shrinking and swelling.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the moderately slow permeability. Installing perimeter drains around the absorption fields helps to lower the water table.

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

Ju—Jules silt loam, frequently flooded. This deep, nearly level, well drained soil is on slight swells on flood plains. It is frequently flooded for very brief to long periods. Areas are generally elongated and are 3 to 225 acres in size. The dominant size is about 50 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is brown, friable silt loam about 24 inches thick. The underlying material to a depth of about 60 inches is brown silty clay loam. In many areas the soil has less clay throughout. In a few areas it has a darker surface layer. In some areas the underlying material is loamy very fine sand. In other areas the soil is not calcareous throughout.

Included with this soil in mapping are a few areas of the somewhat excessively drained Moundhaven and well drained Stonelick soils in the higher positions. Stonelick soils have more sand than the Jules soil. Also included are some areas of somewhat poorly drained soils in sloughs and few areas of the well drained Armiesburg Variant soils on the lower parts of the landscape. Armiesburg Variant soils have more clay than the Jules soil. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Jules soil is very high. Permeability is moderate. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

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

This soil is well suited to corn and soybeans, but it is very poorly suited to winter wheat because of the flooding. Crusting is a problem. Delayed planting and, in some years, replanting of corn and soybeans are needed because of the flooding. Levees and upstream flood-control measures can provide total protection. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall or flooding. These practices help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to spring chiseling, spring plowing, and no-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. The flooding is a hazard. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes because of the flooding. Overgrazing or grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, help to maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

The flooding and frost action severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water and prevent the damage caused by frost action. Levees can help to control flooding. Conveying runoff to suitable outlets reduces the potential for frost action.

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

LcA—Lafayette silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is along drainageways and on low rises. Areas are generally irregular in shape and are 3 to 100 acres in size. The dominant size is about 45 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 48 inches thick. In sequence downward, it is brown and dark yellowish brown, mottled, friable silty clay loam; yellowish brown, mottled, friable sandy clay loam; and brown, mottled, friable gravelly sandy loam. The underlying material to a depth of about 70 inches is grayish brown very gravelly coarse sand. In some places the upper part of the subsoil has more sand and less silt. In other places, the slope is more than 2 percent and the soil is moderately eroded. In a few areas the lower part of the subsoil and the underlying material have less gravel. In a few places the soil has a thinner surface layer. In some areas the lower part of the underlying material is glacial till.

Included with this soil in mapping are some small areas of the moderately well drained Waupecan soils on slight rises. Also included are a few areas of the very poorly drained Comfrey and poorly drained Drummer soils in depressions. Included soils make up about 6 to 11 percent of the map unit.

The available water capacity of the Lafayette soil is high. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 1 to 3 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. The root zone is shallow because of excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can lower the water table. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. Excess water and frost heaving are limitations. Surface drains, subsurface drains, or a combination of these can lower the water table. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

Ld—La Hogue silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats and low rises. Areas are irregular in shape and are 3 to 40 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer also is very dark grayish brown silt loam. It is about 3 inches thick. The subsoil is about 39 inches thick. In sequence downward, it is dark yellowish brown, mottled, friable clay loam; yellowish brown, mottled, friable loam; and yellowish brown, mottled, very friable sandy loam that has thin strata of loamy sand and loam. The underlying material to a depth of about 60 inches is brown, mottled fine sandy loam that has thin strata of loamy sand and fine sand. In a few places the subsoil has less sand. In some areas, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of less than 40 inches or more than 60 inches. In places the upper part of the underlying material has more sand and gravel. In a few areas the soil has a lighter colored or thinner surface layer. In a few places it has glacial till in the underlying material. In some areas the lower part of the solum contains less sand and more clay.

Included with this soil in mapping are some small areas of the moderately well drained Billett and Glenhall soils on the higher, more sloping parts of the landscape. These soils make up about 6 to 11 percent of the map unit.

The available water capacity of the La Hogue soil is high. Permeability is moderate in the upper part of the solum and moderate or moderately rapid in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate or high. Runoff is slow. The water table is at a depth of 1 to 3 feet from late winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Excess water is a limitation. It hinders normal root growth and results in a shallow root zone. Crusting is a problem. Surface and subsurface drains can remove excess water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. The seasonal high water table is a limitation. Surface drains, subsurface drains, or a combination of these can remove excess water. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

Lk—La Hogue silt loam, till substratum, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad flats and low rises. Areas are irregular in shape and are 3 to 40 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, mottled, friable clay loam and sandy clay loam, and the lower part is yellowish brown, mottled, very friable sandy loam that has thin strata of loamy sand. The upper part of the underlying material is yellowish brown, mottled sandy loam that has thin strata of loamy sand and silt loam. The lower part to a depth of about 60 inches is light olive brown, mottled loam. In a few places the subsoil has less sand. In some areas, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of less than 40 inches or more than 60 inches. In some places the lower part of the solum contains less sand and more clay. In other places the upper part of the underlying material has more sand and gravel. In a few areas the underlying material is stratified and is sandy and loamy throughout, and in a few of these areas the surface layer is lighter colored or thinner. In a few places the underlying material is glacial till throughout. In a few areas the glacial till is within a depth of 40 inches.

Included with this soil in mapping are some small areas of the moderately well drained Billett and Glenhall soils on the higher, more sloping parts of the landscape. These soils make up about 6 to 11 percent of the map unit.

The available water capacity of the La Hogue soil is high. Permeability is moderate in the solum and moderately slow in the underlying glacial till. The content of organic matter in the surface layer is moderate or high. Runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. The root zone is shallow because of excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can remove the excess water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay and pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. The seasonal high water table is a limitation. Surface drains, subsurface drains, or a combination of these can remove excess water. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

Lp—Landes-Chatterton complex, frequently flooded. These deep, nearly level, well drained soils are on slight swells on flood plains. They are frequently flooded for very brief periods. Areas are generally long and narrow and are 3 to 450 acres in size. The dominant size is about 100 acres. This map unit is about 55 percent Landes soil, 35 percent Chatterton soil, and 10 percent other soils. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

In a typical profile, the surface soil of the Landes soil is very dark grayish brown fine sandy loam about 11 inches thick. The subsoil is about 27 inches thick. It is dark brown and dark yellowish brown, very friable fine sandy loam in the upper part and dark yellowish brown, very friable sandy loam in the lower part. The underlying material to a depth of about 60 inches is dark yellowish brown, stratified loamy sand and sand. In a few areas the soil has a lighter colored surface layer. In some places it has a dark surface soil that is more than 24 inches thick. In other places the slope is more than 2 percent. In some areas the soil has more gravel. In a few areas the solum has more clay. In places bedrock is within a depth of 60 inches.

In a typical profile, the surface soil of the Chatterton soil is very dark grayish brown loamy sand about 12 inches thick. The subsoil is about 20 inches thick. In sequence downward, it is dark brown, very friable loamy sand; dark brown, very friable loamy sand that has thin strata of sandy loam and silt loam; and dark yellowish brown, very friable loamy sand. The underlying material to a depth of about 60 inches is brown and yellowish brown sand that has thin strata of sandy loam and loam. In some areas the soil has more gravel. In a few areas the surface soil is more than 24 inches thick. In some places the surface layer is lighter colored. In other places the slope is more than 2 percent. In a few areas bedrock is within a depth of 60 inches.

Included with these soils in mapping are small areas of the somewhat excessively drained Moundhaven and well drained Stonelick soils in the higher positions on the landscape. Also included are a few areas of the well drained Ormas and Oshtemo soils on terraces. The included soils are lighter colored in the surface layer than the Landes and Chatterton soils. They make up about 5 to 10 percent of the map unit.

The available water capacity is moderate in the Landes soil and low in the Chatterton soil. Permeability is moderately rapid in the solum of the Landes soil and rapid in the underlying material. It is rapid in the Chatterton soil. The content of organic matter is moderately low in the surface layer of both soils. Runoff is very slow. The surface layer is very friable and can be easily tilled throughout a very wide range in moisture content.

Most areas of these soils are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

These soils are fairly well suited to corn and soybeans. They are poorly suited to fall-planted small grain, which can be severely damaged during periods of prolonged flooding. The flooding, soil blowing, and droughtiness are the main management concerns. Planting short-season varieties of adapted crops can reduce the extent of flood damage. Late planting of crops also reduces the extent of this damage. In some areas constructing dikes or water-retention structures can prevent flooding. Installing a surface drainage system allows the planting of longer season varieties of adapted crops. Cutbanks are unstable; therefore, caution is needed in operating heavy equipment near open excavations.

Some conservation practices can reduce the hazard of soil blowing. They are crop rotations that include grasses and legumes, critical area planting, stripcropping, cover crops and green manure crops, a system of conservation tillage that leaves all or part of the crop residue on the surface, and a permanent cover of vegetation. Crops that are planted in fall or early spring can make good use of the limited amount of available water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soils are well suited to spring chiseling and spring plowing.

These soils are well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow best. Droughtiness, flooding, and soil blowing are the main management concerns. Other management concerns are overgrazing and grazing when the soils are too wet. Overgrazing reduces plant density and hardiness. Overgrazing and grazing during wet periods cause surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of drought-resistant grasses and legumes reduces the hazard of soil blowing. Increased plant density also helps to control soil blowing. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are well suited to trees. Plant competition is severe on the Landes soil and moderate on the Chatterton soil. In some years the frequent flooding hinders harvesting and logging activities and the planting of seedlings. The seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the flooding, these soils are generally unsuitable as sites for dwellings and sanitary facilities and are severely limited as sites for local roads. Constructing the roads on raised, well compacted, suitable fill material, crowning the roads, constructing adequate roadside ditches, and installing culverts help to remove excess water. Levees help to control flooding.

The land capability classification is IIIw. The woodland ordination symbol is 7A in areas of the Landes soil and 6A in areas of the Chatterton soil.

MaB3—Markham silty clay loam, 2 to 6 percent slopes, severely eroded. This deep, gently sloping, moderately well drained soil is along drainageways and on high rises, side slopes, ridgetops, and knolls in the uplands. Areas are generally irregular in shape and are 3 to 20 acres in size. The dominant size is about 10 acres.

In a typical profile, the surface layer is dark brown silty clay loam mixed with dark yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is firm silty clay loam about 21 inches thick. It is dark yellowish brown in the upper part and olive brown and mottled in the lower part. The underlying material to a depth of about 60 inches is light olive brown, mottled silt loam. In places the slope is less than 2 percent or more than 6 percent. In many small areas the underlying material is within a depth of 20 inches. In some areas the soil has a lighter colored surface layer. In a few areas the surface layer has been mixed with the underlying material by plowing and is cloddy, calcareous silty clay loam. In some places the upper part of the subsoil has more sand and gravel. In other places the soil is less eroded.

Included with this soil in mapping are some areas of the somewhat poorly drained Elliott soils on the slightly lower or less sloping parts of the landscape. Also included are a few areas of the poorly drained Drummer soils in depressions. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Markham soil is moderate. Permeability is moderately slow. The content of organic matter in the surface layer is moderately low. Runoff is medium. The water table is at a depth of 3 to 6 feet from late winter to late spring. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods harden when dry and make seedbed preparation difficult.

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

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

McB2—Markham-Symerton silt loams, 2 to 6 percent slopes, eroded. These deep, gently sloping, moderately well drained soils are in broad areas, along drainageways, on high rises, along side slopes, on ridgetops, and on knolls in the uplands. Areas are irregular in shape and are 3 to more than 500 acres in size. The dominant size is about 80 acres. This unit is about 60 percent Markham soil, 35 percent Symerton soil, and 5 percent other soils. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

In a typical profile, the surface layer of the Markham soil is very dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 8 inches thick. The subsoil is silty clay loam about 30 inches thick. The upper part is yellowish brown and light olive brown and is friable and firm, and the lower part is light olive brown and olive brown, mottled, and firm. The underlying material to a depth of about 60 inches is light olive brown silt loam. In places the slope is less than 2 percent or more than 6 percent. In some small areas the underlying material is within a depth of 20 inches. In some places the surface layer is thicker. In other places it is lighter colored. In some areas the soil is more eroded. In places the upper part of the underlying material is stratified and is sandy and loamy. In a few areas the soil has less clay and more sand in the upper part of the subsoil.

In a typical profile, the surface layer of the Symerton soil is very dark gray silt loam mixed with dark yellowish brown silty clay loam from the subsoil. It is about 10 inches thick. The subsoil is about 34 inches thick. In sequence downward, it is dark yellowish brown, friable silty clay loam and clay loam; brown, mottled, friable clay loam; and light olive brown, mottled, firm silty clay loam. The underlying material to a depth of about 60 inches is light olive brown, mottled silty clay loam. In a few places the subsoil has less sand and more silt. In places the slope is less than 2 percent or more than 6 percent. In a few areas the soil has less clay and more sand in the upper part of the subsoil. In some areas the underlying material is at a depth of less than 30 inches or more than 50 inches. In some small areas the upper part of the subsoil has more clay. In a few places the surface layer is lighter colored or thinner. In some areas the upper part of the underlying material is stratified and is sandy and loamy. In other areas the soil is more eroded.

Included with these soils in mapping are some areas of the somewhat poorly drained Elliott and Williamsport soils on the slightly lower parts of the landscape. Also included are a few areas of the poorly drained Drummer soils in depressions. Included soils make up about 5 to 12 percent of the map unit.

The available water capacity of the Markham and Symerton soils is high. Permeability is moderately slow in the Markham soil. It is moderate in the upper part of the solum in the Symerton soil and moderately slow in the lower part and in the underlying material. The content of organic matter is moderate in the surface layer of both soils. Runoff is medium. From late winter to late spring, the water table in the Markham soil is at a depth of 3.0 to 6.0 feet and the one in the Symerton soil is at a depth of 3.5 to 6.0 feet. The surface layer of both soils is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some areas are used for hay or pasture.

These soils are well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content.

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and help to keep the pasture in good condition.

The Markham soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of these soils as sites for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soils as sites for dwellings with basements. Foundations, footings, and basements walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of the Markham soil as a site for local roads and streets. Low strength moderately limits the use of the Symerton soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

The land capability classification is IIe. The woodland ordination symbol is 4A in areas of the Markham soil. A woodland ordination symbol has not been assigned to the Symerton soil.

MdA—Martinsville loam, 0 to 2 percent slopes. This nearly deep, level, well drained soil is in broad areas and on rises, ridgetops, and knolls near streams. Most areas are irregular in shape and are 3 to 30 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 50 inches thick. In sequence downward, it is light yellowish brown, friable loam; yellowish brown and strong brown, friable clay loam; and brown and yellowish brown, friable loam and sandy loam. The underlying material to a depth of about 60 inches is yellowish brown sandy loam that has thin strata of loam and loamy sand. In places the slope is more than 2 percent. In a few places the soil has gray mottles in the lower part of the subsoil. In some areas the underlying material is within a depth of 40 inches. In other areas it is loam glacial till. In a few areas the lower part of the solum has more gravel. In a few places the soil is more eroded. In some areas the solum has less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Starks soils and small areas of somewhat poorly drained soils in which the texture of the subsoil is similar to that the Martinsville soil. Both of these included soils are on the slightly lower parts of the landscape. Also included are a few areas of the excessively drained Rodman soils on steep and very steep breaks. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Martinsville soil is high. Permeability is moderate in the solum and moderate or moderately rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is slow. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, pasture rotation, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is suitable as a site for dwellings with basements and as a site for septic tank absorption fields. The shrink-swell potential moderately limits the use of the soil as a site for dwellings without basements. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Frost action and the shrink-swell potential moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

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

MdB2—Martinsville loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is in broad areas and on rises, ridgetops, and knolls near streams. Most areas are irregular in shape and are 3 to 40 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is dark brown loam mixed with yellowish brown loam from the subsoil. It is about 6 inches thick. The subsoil is about 50 inches thick. In sequence downward, it is yellowish brown, friable loam; strong brown, friable clay loam; and strong brown, firm clay loam and sandy clay loam. The underlying material to a depth of about 60 inches is yellowish brown sandy loam that has thin strata of silt loam, loam, and loamy sand. In some areas the slope is less than 2 percent or more than 6 percent. In a few places the soil has gray mottles in the lower part of the subsoil. In some places the underlying material is within a depth of 40 inches. In other places the soil has loam glacial till in the underlying material. In a few areas the loam glacial till is in the lower part of the solum. In a few places the soil is more eroded. In some areas the solum has less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Starks soils and small areas of somewhat poorly drained soils in which the texture of the subsoil is similar to that the Martinsville soil. Both of these included soils are on the slightly lower parts of the landscape. Also included, on steep and very steep breaks, are a few areas of the excessively drained Rodman soils. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Martinsville soil is high. Permeability is moderate in the solum and moderate or moderately rapid in the underlying material. The content of organic matter in the surface layer is low or moderately low. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is suitable as a site for dwellings. Frost action moderately limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action.

The restricted permeability moderately limits the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste.

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

MdC2—Martinsville loam, 6 to 12 percent slopes, eroded. This deep, moderately sloping, well drained soil is along narrow drainageways, on slight rises, along side slopes, on ridgetops, and on knolls on stream terraces. Most areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is brown loam mixed with yellowish brown clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 42 inches thick. In sequence downward, it is yellowish brown, friable clay loam; brown, friable sandy clay loam; and yellowish brown, friable sandy loam. The underlying material to a depth of about 60 inches is yellowish brown sandy loam that has thin strata of silt loam and loamy fine sand. In some places the subsoil has less clay. In other places the slope is less than 6 percent or more than 12 percent. In a few places the lower part of the subsoil has gray mottles. In some small areas the underlying material is within a depth of 40 inches. In some areas it has loam glacial till. In a few areas the lower part of the solum has more gravel. In places the soil is more eroded.

Included with this soil in mapping are small areas of the somewhat poorly drained Starks soils and small areas of somewhat poorly drained soils in which the texture of the subsoil is similar to that the Martinsville soil. Both of these included soils are on the slightly lower parts of the landscape. Also included are a few areas of the excessively drained Rodman soils on steep and very steep breaks. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Martinsville soil is high. Permeability is moderate in the solum and moderate or moderately rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The slope moderately limits the use of this soil as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope.

Frost action and the slope moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Land shaping and constructing the roads on the contour help to overcome the slope.

The slope and the moderate permeability in the solum are moderate limitations affecting the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Land shaping, installing the distribution lines across the slope, and installing deep wells in upslope areas help to overcome the slope.

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

MoE2—Miami loam, 15 to 25 percent slopes, eroded. This deep, strongly sloping or moderately steep, well drained soil is along narrow drainageways and on side slopes, ridgetops, and knolls in the uplands. Areas generally are irregular in shape and are about 5 acres in size. The size ranges from 3 to 40 acres.

In a typical profile, the surface layer is dark brown loam mixed with brown clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 22 inches thick. It is brown, friable clay loam in the upper part and yellowish brown, friable clay loam and loam in the lower part. The underlying material to a depth of about 60 inches is light olive brown loam. In some places the subsoil has less sand and more silt. In other places the slope is less than 15 percent or more than 25 percent. In some small areas the underlying material is at a depth of less than 24 inches or more than 40 inches. In a few areas the subsoil has more sand and gravel. In a few places the surface layer has a darker color. In some areas the soil is more eroded. In some small areas the upper part of the subsoil has less clay.

Included with this soil in mapping are areas of the moderately well drained Rainsville, Rockfield, and Williamstown soils on the less sloping parts of the landscape. Also included are the somewhat poorly drained Wakeland Variant and poorly drained Washtenaw soils in the lower areas. Included soils make up about 3 to 7 percent of the map unit.

The available water capacity of the Miami soil is moderate. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderately low.

Runoff is rapid. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is generally unsuited to corn, soybeans, and small grain. Erosion and runoff are hazards.

This soil is poorly suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and is fairly well suited to pasture. Erosion and runoff are hazards. Operating some types of equipment on the steeper slopes can be hazardous. A system of conservation tillage that leaves protective amounts of crop residue on the soil is needed in establishing or renovating hay or pasture. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and 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. Laying out logging roads, skid trails, and landings on gentle grades helps to control erosion. Water should be removed by water bars, out-sloping road surfaces, culverts, and drop structures. Care is needed in operating equipment on the steeper slopes. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities. The slope and low strength severely limit the use of this soil as a site for local roads. Cutting and filling and constructing the roads on the contour help to overcome the slope. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

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

MpC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This deep, moderately sloping, well drained soil is along narrow drainageways and on rises, side slopes, ridgetops, and knolls in the uplands. Areas generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 85 acres.

In a typical profile, the surface layer is dark yellowish brown clay loam mixed with yellowish brown clay loam from the subsoil. It is about 6 inches thick. The subsoil is about 19 inches thick. It is yellowish brown, friable clay loam in the upper part and light olive brown, friable clay loam and loam in the lower part. The underlying material to a depth of about 60 inches is light yellowish brown loam. In a few small areas the surface layer has been mixed with the underlying material by plowing and is yellowish brown, cloddy, calcareous clay loam. In places the slope is less than 6 percent or more than 12 percent. In a few areas the underlying material is silt loam glacial till. In some areas the solum is less than 24 or more than 40 inches thick. In a few areas the subsoil has more sand and gravel. In some areas the soil is less eroded. In a few places the underlying material has gray mottles.

Included with this soil in mapping are small areas of the poorly drained Washtenaw and somewhat poorly drained Wakeland Variant soils on the lower parts of the landscape. Also included are some areas of the moderately well drained Rainsville, Rockfield, and Williamstown soils on the less sloping parts of the landscape. Included soils make up about 5 to 7 percent of the map unit.

The available water capacity of the Miami soil is moderate. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is low. Runoff is rapid. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is fairly well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and is well suited to pasture. Erosion and runoff are hazards. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the slope moderately limit the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Excavating and then backfilling with suitable material, using expansion joints, or providing soil additives helps to prevent structural damage. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

The moderately slow permeability severely limits the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste.

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

MpD3—Miami clay loam, 12 to 18 percent slopes, severely eroded. This deep, strongly sloping, well drained soil is along narrow drainageways and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas generally are irregular in shape and are about 10 acres in size. The size ranges from 3 to 15 acres.

In a typical profile, the surface layer is dark yellowish brown clay loam mixed with yellowish brown clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 17 inches thick. It is yellowish brown, friable clay loam in the upper part and light olive brown, friable loam in the lower part. The underlying material to a depth of about 60 inches is light olive brown loam. In a few small areas the surface layer has been mixed with the underlying material by plowing and is yellowish brown, cloddy, calcareous clay loam. In places the slope is less than 12 percent or more than 18 percent. In a few areas the underlying material is silt loam glacial till. In many areas the solum is less than 24 inches thick. In a few areas the subsoil has more sand and gravel. In some areas the soil is less eroded. In a few places the underlying material has gray mottles.

Included with this soil in mapping are small areas of the poorly drained Washtenaw and somewhat poorly drained Wakeland Variant soils on the lower parts of the landscape. Also included are some areas of the moderately well drained Rainsville, Rockfield, and Williamstown soils on the less sloping parts of the landscape. Included soils make up about 5 to 7 percent of the map unit.

The available water capacity of the Miami soil is moderate. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is low. Runoff is rapid. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and hinder seedbed preparation.

Most areas of this soil are used for cultivated crops or pasture. Some areas are used as hayland or woodland.

This soil is generally unsuited to corn, soybeans, and

Figure 7.—A permanent cover of grasses and legumes in an area of Miami clay loam, 12 to 18 percent slopes, severely eroded.

small grain because erosion and runoff are hazards. Crusting and the slope are problems.

This soil is poorly suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and is fairly well suited to pasture. Erosion and runoff are hazards. Operating some types of equipment on the steeper slopes is hazardous. A system of conservation tillage that leaves protective amounts of crop residue on the surface is needed in establishing grasses and legumes. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion (fig. 7). Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The slope is a severe limitation affecting the use of this soil as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas.

Establishing diversions between lots and installing retaining walls also help to overcome the slope.

The slope and low strength severely limit the use of this soil as a site for local roads and streets. Land shaping and constructing the roads on the contour help to overcome the slope. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

The slope and the moderately slow permeability severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Land shaping, installing the distribution lines across the slope, and installing deep wells in upslope areas help to overcome the slope.

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

Mr—Milford silty clay loam, pothole. This deep, nearly level, very poorly drained soil is in depressions and potholes. It is frequently ponded by runoff from the adjacent areas. Most areas are oval or round and are about 15 acres in size. Some areas are irregular in shape and range from 3 to 40 acres in size.

In a typical profile, the surface layer is black silty clay loam about 11 inches thick. The subsurface layer also is black silty clay loam. It is about 5 inches thick. The subsoil is firm silty clay loam about 39 inches thick. It is dark gray in the upper part and gray and mottled in the lower part. The underlying material to a depth of about 60 inches is gray, mottled silty clay loam. In places the slope is more than 2 percent. In some small areas the underlying material is at a depth of less than 36 inches or more than 60 inches. In a few places the dark surface soil is more than 24 inches thick. In some areas the underlying material is glacial till. In other areas the soil has marl in the underlying material.

Included with this soil in mapping are some small areas of the moderately well drained Montmorenci soils and somewhat poorly drained soils on the higher parts of the landscape. Also included are a few areas of the very poorly drained Warners Variant and poorly drained Washtenaw soils on the less concave parts of the landscape. Warners Variant soils have less clay in the subsoil than the Milford soil. Included soils make up about 2 to 6 percent of the map unit.

The available water capacity of the Milford soil is high. Permeability is moderately slow. The content of organic matter in the surface layer is high. Runoff is ponded or very slow. The water table is at or above the surface from late winter to early summer. The surface layer is firm and becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and hinder seedbed preparation.

Most areas of this soil are used for cultivated crops or habitat for wildlife. Some areas are used as woodland.

This soil is poorly suited to corn and soybeans. Ponding is a hazard. A cold soil temperature and a scarcity of drainage outlets are limitations. The root zone is shallow because of excess water. In ponded areas, the use of equipment is limited and machinery can bog down when the soil is wet. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can help to remove excess water. Small enclosed depressions can be drained by an open inlet pipe in conjunction with subsurface drains. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimizes surface compaction, and maintains soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent excessive crusting after periods of heavy rainfall. The soil is suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Surface drains, subsurface drains, pumps, or a combination of these can help to remove excess water. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the moderately slow permeability and the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Frost action, low strength, and ponding severely limit the use of the soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by frost action, and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

MtA—Millbrook silt loam, till substratum, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is along narrow drainageways, in flat, low areas, and on low rises. Areas generally are irregular in shape and are about 25 acres in size. The size ranges from 3 to 100 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 40 inches thick. In sequence downward, it is light brownish gray and brown, mottled, friable silty clay loam; yellowish brown, mottled, friable loam; and yellowish brown, mottled, friable loam that has thin lenses of sandy loam, loamy sand, and silt loam. The upper part of the underlying material is yellowish brown, mottled sandy loam that has thin lenses of sand, loamy fine sand, and loam. The lower part to a depth of about 60 inches is light olive brown loam. In places, the slope is more than 2 percent and the soil is moderately eroded. In some areas the subsoil has more sand and less silt. In some small areas the underlying material is within a depth of 40 inches. In a few places the soil has a thicker dark surface layer. In a few areas it has a lighter colored surface layer. In some areas the underlying material is stratified and is sandy and loamy throughout.

Included with this soil in mapping are a few small areas of the moderately well drained Camden, Proctor, and Rockfield soils on the higher parts of the landscape. These soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Millbrook soil is high. Permeability is moderate in the solum and moderately slow in the underlying glacial till. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 1 to 3 feet from late winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. The root zone is shallow because of excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can remove excess water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops improve or help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay and pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. The seasonal high water table and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Surface drains, subsurface drains, or a combination of these can remove excess water. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table and the moderately slow permeability in the lower part of the underlying material severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

MuC2—Montmorenci-Barce complex, 6 to 12 percent slopes, eroded. These deep, moderately sloping, moderately well drained soils are along drainageways and on broad flats, rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 20 acres in size. The dominant size is about 15 acres. This map unit is about 60 percent Montmorenci soil, 30 percent Barce soil, and 5 to 10 percent other soils. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

In a typical profile, the surface layer of the Montmorenci soil is dark brown loam mixed with yellowish brown clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 27 inches thick. It is yellowish brown, friable clay loam in the upper part and yellowish brown, mottled, friable loam in the lower part. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the slope is less than 6 percent or more than 12 percent. In some areas silt loam glacial till is in the underlying material. In some small areas the underlying material is less than 24 inches or more than 40 inches. In some places the soil has a thicker surface layer. In other places the underlying material is stratified and is sandy and loamy. In a few areas the soil has a lighter colored surface layer. In some areas it is more eroded.

In a typical profile, the surface layer of the Barce soil is very dark grayish brown silt loam mixed with yellowish brown loam from the subsoil. It is about 10 inches thick. The subsoil is about 38 inches thick. In sequence downward, it is yellowish brown, friable loam and clay loam; yellowish brown, mottled, friable sandy clay loam; and light olive brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In places the slope is less than 6 percent or more than 12 percent. In a few areas the upper part of the subsoil has less clay and more sand. In many small areas the underlying material is within a depth of 40 inches, and in a few areas it is at a depth of more than 60 inches. In many small areas the upper part of the subsoil has less sand. In many places the surface layer is lighter colored or thinner. In a few places the upper part of the underlying material is stratified and is sandy and loamy. In some areas the soil is more eroded. In a few areas it has silt loam glacial till in the underlying material.

Included with these soils in mapping are some small areas of the somewhat poorly drained Brenton and Gilboa soils and soils that have a thicker surface layer and the same sand content as the Montmorenci and Barce soils. These soils are on the less sloping parts of the landscape. Also included are areas of the very poorly drained Milford and Peotone soils in depressions. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity is moderate in the Montmorenci soil and high in the Barce soil. Permeability is moderate in the upper part of the solum in the Barce soil and moderately slow in the lower part and in the underlying material. It is moderate in the solum of the Montmorenci soil and moderately slow in the underlying material. The content of organic matter is moderate in the surface layer of both soils. Runoff is medium. From early winter to late spring, the water table is at a depth of 2 to 4 feet in the Montmorenci soil and at a depth of 3 to 4 feet in the Barce soil. The surface layer of both soils is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some areas are used for hay or pasture.

These soils are fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soils are well suited to no-till and ridge-till cropping systems.

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential and the slope moderately limit the use of these soils as sites for dwellings without basements. On sites for dwellings with basements, the seasonal high water table of the Montmorenci soil is a severe limitation and the seasonal high water table, shrink-swell potential, and slope of the Barce soil are moderate limitations. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope. The dwellings should be constructed without basements.

Low strength and the shrink-swell potential limit the use of the Montmorenci soil as a site for local roads and streets, and frost action, the shrink-swell potential, and the slope limit the Barce soil. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling. Conveying runoff to a suitable outlet helps to prevent the damage caused by frost action. Land shaping and constructing the roads on the contour help to overcome the slope.

The moderately slow permeability and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

MvE2—Morley silt loam, moderately wet, 15 to 25 percent slopes, eroded. This deep, strongly sloping or moderately steep, moderately well drained soil is along narrow drainageways and on side slopes in the uplands. Most areas are irregular in shape and are 3 to 50 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is silty clay loam about 22 inches thick. The upper part is yellowish brown and is friable and firm. The lower part is yellowish brown and light olive brown, mottled, and firm. The underlying material to a depth of about 60 inches is light olive brown, mottled silt loam. In places the slope is less than 15 percent or more than 25 percent. In some small areas the underlying material is within a depth of 20 inches. In a few areas the upper part of the subsoil has more sand and gravel. In some areas the soil is more eroded. In other areas the subsoil has less clay.

Included with this soil in mapping are small areas of the moderately well drained Beckville soils on the lower part of flood plains. These soils are grayer in the subsoil than the Morley soil. Also included are the somewhat poorly drained Blount soils in the less sloping areas and a few areas of the well drained Hennepin soils on the steeper breaks. Included soils make up about 5 to 15 percent of the map unit.

The available water capacity of the Morley soil is moderate. Permeability is moderately slow. The content of organic matter in the surface layer is moderate. Runoff is rapid. The water table is at a depth of 3 to 6 feet in spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is generally unsuited to corn, soybeans, and small grain. It is poorly suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and is fairly well suited to pasture. Erosion and runoff are hazards. Operating equipment on the steeper slopes is hazardous. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain plant density and hardiness, and 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. Care is needed in operating equipment on the steeper slopes. Logging roads, skid trails, and landings should be located on gentle grades. Water bars, out-sloping road surfaces, culverts, and drop chutes help to control erosion and reduce the runoff rate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Low strength and the slope severely limit the use of the soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity. Land shaping and constructing the roads on the contour help to overcome the slope.

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

MwC3—Morley silty clay loam, moderately wet, 6 to 12 percent slopes, severely eroded. This deep, moderately sloping, moderately well drained soil is along narrow drainageways and on rises, long side slopes, ridgetops, and knolls in the uplands. Most areas are irregular in shape and are 3 to 75 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is brown silty clay loam mixed with yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is yellowish brown, firm silty clay loam about 17 inches thick. It is mottled in the lower part. The underlying material to a depth of about 60 inches is light olive brown, mottled silt loam. In places the slope is less than 6 percent or more than 12 percent. In some small areas the underlying material is within a depth of 20 inches. In a few small areas the surface layer has been mixed with the underlying material by plowing and is yellowish brown, cloddy, calcareous silty clay loam. In a few places the upper part of the subsoil has more sand and less clay. In some areas the soil is less eroded.

Included with this soil in mapping are some small areas of the somewhat poorly drained Blount soils on the less sloping parts of the landscape. Also included are a few areas of the moderately well drained Beckville soils on the lower parts of flood plains and a few areas of the well drained Hennepin soils on the steeper breaks. Beckville soils are grayer in the subsoil than the Morley soil. Included soils make up about 4 to 7 percent of the map unit.

The available water capacity of the Morley soil is moderate. Permeability is moderately slow. The content of organic matter in the surface layer is moderately low. Runoff is rapid. The water table is at a depth of 3 to 6 feet in spring. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to a no-till cropping system.

This soil is fairly well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and is well suited to pasture. Erosion and runoff are hazards. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the slope moderately limit the use of this soil as a site for dwellings without basements. The slope, the shrink-swell potential, and the seasonal high water table moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material is an alternative. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope. The dwellings should be constructed without basements.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

MxC2—Morley-Cadiz silt loams, moderately wet, 6 to 12 percent slopes, eroded. These deep, moderately sloping, moderately well drained soils are along drainageways and on long side slopes, ridgetops, and knolls in the uplands. Areas generally are irregular in shape but can be long and narrow. They are 3 to 70 acres in size. The dominant size is about 20 acres. The map unit is about 45 percent Morley soil, 30 percent Cadiz soil, and 25 percent other soils. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

In a typical profile, the surface layer of the Morley soil is brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 6 inches thick. The subsoil is silty clay loam about 23 inches thick. It is yellowish brown and friable in the upper part, light olive brown and firm in the next part, and light olive brown, mottled, and firm in the lower part. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silt loam. In places the slope is less than 6 percent or more than 12 percent. In some small areas the underlying material is within a depth of 20 inches. In a few areas the upper part of the subsoil has more sand and less clay. In a few places the soil is browner. In some areas it is more eroded.

In a typical profile, the surface layer of the Cadiz soil is brown silt loam mixed with yellowish brown silt loam from the subsoil. It is about 7 inches thick. The subsoil is about 39 inches thick. In sequence downward, it is yellowish brown, friable silt loam; yellowish brown, mottled, friable and firm silty clay loam; and light olive brown, mottled, firm silt loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silt loam. In places the slope is less than 6 percent or more than 12 percent. In a few places the upper part of the subsoil has more sand and less silt. In some areas the soil is more eroded. In a few areas the soil is browner, and in a few of these areas glacial till is at a depth of more than 60 inches.

Included with these soils in mapping are some small areas of the somewhat poorly drained Blount soils on the less sloping parts of the landscape. Also included are a few areas of the moderately well drained Beckville soils on the lower parts of flood plains adjacent to the base of slopes and a few areas of the well drained Hennepin soils on the steeper breaks. Beckville soils are grayer and wetter than the Morley soil and have more clay than the Cadiz soil. Included soils make up about 7 to 14 percent of the map unit.

The available water capacity is moderate in the Morley soil and high in the Cadiz soil. Permeability is moderately slow in the Morley soil. It is moderate in the upper part of the solum in the Cadiz soil and moderately slow in the lower part and in the underlying material. The content of organic matter is moderate in the surface layer of the Morley soil and moderately low in the surface layer of the Cadiz soil. Runoff is medium on both soils. The water table in the Morley soil is at a depth of 3 to 6 feet in spring. The one in the Cadiz soil is at a depth of 2.5 to 6.0 feet from late fall to late spring. The surface layer of both soils is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

These soils are fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soils are well suited to a no-till cropping system.

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

These soils are well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the slope moderately limit the use of these soils as sites for dwellings without basements. The slope, the shrink-swell potential, and the seasonal high water table moderately limit the use of the soils as sites for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope. The dwellings should be constructed without basements.

Low strength severely limits the use of these soils as sites for local roads and streets. In addition, frost action is a severe limitation in areas of the Cadiz soil. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

MyA—Mudlavia gravelly silt loam, 0 to 2 percent slopes, stony. This deep, nearly level, well drained soil is along drainageways and on broad flats, low rises, and ridgetops on terraces. A few stones 10 to 20 inches in diameter are on the surface. Most areas are irregular in shape and are 3 to 120 acres in size. The dominant size is about 45 acres.

In a typical profile, the surface layer is dark yellowish brown gravelly silt loam about 8 inches thick. The subsoil is about 42 inches thick. It is dark brown, friable extremely gravelly clay loam and extremely gravelly clay in the upper part and dark brown, friable extremely cobbly clay in the lower part. The underlying material to a depth of about 60 inches is light yellowish brown extremely gravelly coarse sand. In places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of more than 72 inches or less than 40 inches. In some areas the solum has a lower content of gravel and cobbles. In a few places the surface layer is darker.

Included with this soil in mapping are some small areas of the well drained Boyer soils on the more sloping parts of the landscape and small areas of the well drained Gosport and excessively drained Rodman soils on steep breaks. Boyer soils have less clay in the subsoil than the Mudlavia soil. Gosport soils have fewer rock fragments than the Mudlavia soil and are underlain by bedrock. Also included, in the slightly lower positions, are a few areas of somewhat poorly drained soils that have textures similar to those of the Mudlavia soil. Included soils make up about 4 to 6 percent of the map unit.

The available water capacity of the Mudlavia soil is low. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The surface layer is friable.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Large stones on the surface hinder tillage and harvesting operations. Insufficient moisture causes droughtiness in summer. Crusting is a problem. Crops that are planted in fall or early spring can make good use of the limited amount of available water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow best. Insufficient moisture causes droughtiness in summer. Large stones, overgrazing, and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Woodland management requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the large stones moderately limit the use of this soil as a site for dwellings. The stones can be excavated. Foundations, footings, and basement walls should be strengthened. Installing a subsurface drainage system and foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material also helps to prevent structural damage.

The shrink-swell potential and frost action moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling. Conveying runoff to a suitable outlet reduces the potential for frost action.

The moderate permeability and the large stones moderately limit the use of this soil as a site for septic tank absorption fields. The stones can be excavated, and then the site can be backfilled with suitable material. Enlarging the absorption fields and using a holding tank help to compensate for the moderate permeability.

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

MzB2—Mudlavia cobbly silt loam, 2 to 4 percent slopes, eroded, stony. This deep, gently sloping, well drained soil is along drainageways, in broad areas, and on rises, knolls, and ridgetops on terraces. A few stones 10 to 20 inches in diameter are on the surface. Most areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 35 acres.

In a typical profile, the surface layer is dark brown cobbly silt loam mixed with brown extremely gravelly clay from the subsoil. It is about 7 inches thick. The subsoil is brown, strong brown, and dark brown, friable extremely gravelly clay about 47 inches thick. The underlying material to a depth of about 60 inches is yellowish brown extremely gravelly loamy coarse sand. In places the slope is less than 2 percent or more than 4 percent. In some small areas the underlying material is at a depth of more than 72 inches or less than 40 inches. In a few places the solum has a lower content of gravel and cobbles. In some areas the surface is darker. In other areas the soil is more eroded.

Included with this soil in mapping are small areas of the well drained Boyer, Gosport, and Ockley soils and the excessively drained Rodman soils. Boyer and Ockley soils have less clay in the subsoil than the Mudlavia soil and have fewer rock fragments. Boyer soils are on the lower part of side slopes. Ockley soils are on the less sloping parts of the landscape. Gosport and Rodman soils are on steep breaks. Gosport soils have fewer rock fragments than the Mudlavia soil and are underlain by bedrock. Also included, in the lower positions, are a few areas of somewhat poorly drained soils that have textures similar to those of the Mudlavia soil. Included soils make up about 6 to 11 percent of the map unit.

The available water capacity of the Mudlavia soil is low. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow or medium. The surface layer is friable.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Large stones on the surface hinder tillage and harvesting operations. Insufficient moisture in summer causes the soil to become droughty. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Crops that are planted in fall or early spring can make good use of the limited amount of available water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is fairly well suited to grasses and legumes, such as bromegrass and alfalfa, for hay and is well suited to pasture. Deep-rooted legumes and drought-tolerant species grow best. Insufficient moisture causes droughtiness in summer. Erosion and runoff are hazards. Large stones, overgrazing, and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Woodland management requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the large stones moderately limit the use of this soil as a site for dwellings. The stones can be excavated. Foundations, footings, and basement walls should be strengthened.

Installing a subsurface drainage system and foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent the structural damage caused by shrinking and swelling.

The shrink-swell potential and frost action moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling. Conveying runoff to a suitable outlet reduces the potential for frost action.

The moderate permeability and the large stones moderately limit the use of this soil as a site for septic tank absorption fields. The stones can be excavated, and then the site can be backfilled with suitable fill material. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste.

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

ObB2—Ockley loam, sandy substratum, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is along drainageways and on rises, knolls, and ridgetops. Most areas are irregular in shape and are 3 to 70 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark brown loam mixed with brown clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 45 inches thick. In sequence downward, it is brown, firm clay loam; dark brown, firm and friable gravelly sandy clay loam; and dark brown, very friable sandy loam. The underlying material to a depth of about 60 inches is yellowish brown loamy sand. In places the upper part of the subsoil has less sand and more silt. In a few areas the subsoil has less clay. In some places the soil has more gravel throughout. In other places the slope is less than 2 percent or more than 6 percent. In a few areas the soil is more eroded. In some small areas the underlying material is at a depth of less than 40 inches or more than 72 inches. In a few places the soil has less gravel in the lower part of the solum.

Included with this soil in mapping are small areas of somewhat poorly drained soils. These soils have textures similar to those of the Ockley soil. They are in the lower positions on the landscape. Also included are a few areas of well drained, severely eroded soils and excessively drained Rodman soils on the steeper slopes. Included soils make up about 4 to 10 percent of the map unit.

The available water capacity of the Ockley soil is moderate. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

The shrink-swell potential and frost action moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

This soil is suitable as a site for septic tank absorption fields.

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

OcA—Ockley silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on broad flats, along drainageways, on low rises, and on ridgetops. Areas are generally irregular in shape and are 3 to 60 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 54 inches thick. In sequence downward, it is dark yellowish brown, friable silty clay loam; yellowish brown, friable clay loam and sandy clay loam; and dark brown and reddish brown, friable gravelly sandy clay loam. The underlying material to a depth of about 80 inches is brown gravelly coarse sand. In some places the upper part of the subsoil has more silt and less sand. In other places, the slope is more than 2 percent and the soil is moderately eroded. In a few places the soil is moderately well drained. In some small areas the underlying material is at a depth of less than 40 inches or more than 72 inches. In a few places loam glacial till is in the underlying material. In a few areas the surface layer is darker and thicker, and in some of these areas the subsoil has more silt and less sand. In a few places the subsoil has less clay. In places the lower part of the solum has less gravel.

Included with this soil in mapping are some small areas of somewhat poorly drained soils. These soils have textures similar to those of the Ockley soil. They are in the slightly lower positions. Also included are a few areas of the well drained Mudlavia and excessively drained Rodman soils. Mudlavia soils have more clay and more rock fragments than the Ockley soil. They are on the more sloping parts of the landscape. Rodman soils are on steep breaks. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Ockley soil is high. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is slow. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Low strength and the shrink-swell potential moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material and strengthening or replacing the base material improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

This soil is suitable as a site for septic tank absorption fields.

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

OcB2—Ockley silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is in broad areas, along drainageways, and on rises, long side slopes, ridgetops, and knolls. Areas generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 40 acres.

In a typical profile, the surface layer is dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 9 inches thick. The subsoil is about 51 inches thick. In sequence downward, it is yellowish brown, friable silty clay loam; brown, friable clay loam; and strong brown and dark brown, friable gravelly sandy clay loam. The underlying material to a depth of about 80 inches is pale brown gravelly coarse sand. In some places the upper part of the subsoil has more silt and less sand. In other places the slope is less than 2 percent or more than 6 percent. In a few areas the soil is moderately well drained. In some small areas the underlying material is at a depth of less than 40 inches or more than 72 inches. In a few places loam glacial till is in the underlying material. In a few areas the surface layer is darker and thicker, and in some of these areas the subsoil has more silt and less sand. In places the soil is more eroded. In a few areas the subsoil has less clay. In some areas the soil has less gravel in the lower part of the solum.

Included with this soil in mapping are some small areas of somewhat poorly drained soils. These soils have textures similar to those of the Ockley soil. They are in the slightly lower positions. Also included are a few areas of the well drained Mudlavia and excessively drained Rodman soils. Mudlavia soils have more clay and more rock fragments than the Ockley soil. They are on the more sloping parts of the landscape. Rodman soils are on steep breaks. Included soils make up about 3 to 6 percent of the map unit.

The available water capacity of the Ockley soil is high. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

The shrink-swell potential and low strength moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material and strengthening or replacing the base material improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

This soil is suitable as a site for septic tank absorption fields.

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

OpB—Ormas loamy sand, 1 to 4 percent slopes. This deep, nearly level or gently sloping, well drained soil is on slight rises, ridgetops, and knolls adjacent to streams. Areas generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 60 acres.

In a typical profile, the surface layer is dark brown loamy sand about 7 inches thick. The subsurface layer is dark yellowish brown and yellowish brown, very friable loamy sand about 30 inches thick. The subsoil is about 35 inches thick. It is brown, very friable gravelly coarse sandy loam in the upper part and strong brown, friable gravelly sandy clay loam in the lower part. The underlying material to a depth of about 80 inches is dark yellowish brown very gravelly coarse sand. In some areas the lower part of the subsoil has less clay. In other areas the slope is more than 4 percent. In a few areas the lower part of the subsoil and the underlying material have less gravel. In some places bedrock is within a depth of 60 inches. In a few areas the upper part of the solum has more clay. In places the underlying material is at a depth of more than 75 inches.

Included with this soil in mapping are small areas of somewhat poorly drained soils. These soils have textures similar to those of the Ormas soil. They are in the lower positions. Also included are a few areas of the well drained Boyer soils on the higher terraces and small areas of the well drained Chatterton, Du Page, and Landes soils on the lower flood plains at the base of slopes. Boyer soils have more clay than the Ormas soil, Chatterton and Landes soils have less gravel, and Du Page soils have a darker surface layer. Included soils make up about 10 percent of the map unit.

The available water capacity of the Ormas soil is low. Permeability is rapid in the upper part of the solum, moderately rapid in the lower part, and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is slow. The surface layer is very friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Soil blowing is a hazard. Insufficient moisture causes droughtiness in summer. The conservation practices that can help to control soil blowing are windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, stripcropping, cover crops and green manure crops, tillage methods that leave the surface rough, or a permanent cover of vegetation. Ridging at an angle to the prevailing wind also helps to control soil blowing. Fall-seeded crops can make good use of the limited amount of available water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow best. Soil blowing is a hazard. Insufficient moisture causes droughtiness in summer. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control soil blowing. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are seedling mortality and plant competition. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Planting containerized nursery stock or the larger seedlings can reduce the seedling mortality rate. Pine trees, which have a deep taproot system, generally grow well on this soil. Certain harvest methods leave some mature trees to provide shade and protection for seedlings. The seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is suitable as a site for dwellings. Frost action moderately limits the use of the soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action. Conveying runoff to suitable outlets reduces the potential for frost action.

A poor filtering capacity severely limits the use of this soil as a site for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity can result in the pollution of ground water. Enlarging the absorption fields and installing deep wells can reduce the hazard of pollution.

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

OsA—Oshtemo coarse sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is in broad areas and on rises, ridgetops, and knolls adjacent to streams. Areas generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 60 acres.

In a typical profile, the surface layer is dark grayish brown coarse sandy loam about 9 inches thick. The subsoil is about 47 inches thick. In sequence downward, it is dark yellowish brown, very friable coarse sandy loam; brown, friable sandy clay loam and very friable coarse sandy loam; and yellowish brown, very friable loamy coarse sand. The underlying material to a depth of about 60 inches is pale brown gravelly coarse sand. In places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is within a depth of 40 inches. In a few areas the subsoil has more clay and less sand. In a few places the surface layer is darker. In some areas the soil has less clay in the upper part of the solum. In a few areas the solum has more gravel.

Included with this soil in mapping are some small areas of somewhat poorly drained soils. These soils have textures similar to those of the Oshtemo soil. They are in the slightly lower positions. Also included are a few areas of the well drained Boyer soils on steep breaks and a few areas of the well drained Chatterton and Landes soils on the lower flood plains at the base of slopes. Boyer soils have a solum that is thinner than that of the Oshtemo soil, and Chatterton and Landes soils have less gravel. Included soils make up about 3 to 7 percent of the map unit.

The available water capacity of the Oshtemo soil is moderate. Permeability is moderately rapid in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The surface layer is very friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Soil blowing is a hazard. Insufficient moisture causes droughtiness in summer. The conservation practices that can help to control soil blowing are windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, stripcropping, cover crops and green manure crops, tillage methods that leave the surface rough, or a permanent cover of vegetation. Ridging at an angle to the prevailing wind also helps to control soil blowing. Fall-seeded crops can make good use of the limited amount of the available water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow well. Soil blowing is a hazard. Insufficient moisture causes droughtiness in summer. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control soil blowing. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is suitable as a site for dwellings, local roads and streets, and septic tank absorption fields.

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

OsB—Oshtemo coarse sandy loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is in broad areas and on rises, ridgetops, and knolls adjacent to streams. Areas generally are irregular in shape and are about 80 acres in size. The size ranges from 3 to 250 acres.

In a typical profile, the surface layer is dark brown coarse sandy loam about 6 inches thick. The subsurface layer is brown coarse sandy loam about 4 inches thick. The subsoil is about 48 inches thick. It is dark yellowish brown and dark brown, friable coarse sandy loam in the upper part and dark yellowish brown, very friable loamy coarse sand and loose coarse sand in the lower part. The underlying material to a depth of about 60 inches is brown gravelly coarse sand. In places, the slope is less than 2 percent or more than 6 percent and the soil is moderately eroded. In some small areas the underlying material is within a depth of 40 inches. In a few areas the subsoil has more clay and less sand. In some areas the upper part of the solum has less clay. In a few places the solum has more gravel.

Included with this soil in mapping are some small areas of somewhat poorly drained soils. These soils have textures similar to those of the Oshtemo soil. They are in the slightly lower positions. Also included are the well drained Boyer soils on steep breaks and a few areas of the well drained Chatterton and Landes soils on the lower flood plains at the base of slopes. Boyer soils have a solum that is thinner than that of the Oshtemo soil, and Chatterton and Landes soils have less gravel. Included soils make up about 3 to 7 percent of the map unit.

The available water capacity of the Oshtemo soil is moderate. Permeability is moderately rapid in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The surface layer is very friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion, runoff, and soil blowing are hazards. Insufficient moisture causes droughtiness in summer. Some conservation practices help to control soil blowing and water erosion and reduce the runoff rate. They can include diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion and reduces the runoff rate. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, stripcropping, cover crops and green manure crops, tillage methods that leave the surface rough, or a permanent cover of vegetation can help to control soil blowing. Ridging at an angle to the prevailing wind also helps to control soil blowing. Fall-seeded crops can make good use of the limited amount of available water.

Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till cropping systems.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow best. Soil blowing, erosion, and runoff are hazards. Insufficient moisture causes droughtiness in summer. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff, erosion, and soil blowing. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control soil blowing and erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is suitable as a site for dwellings, local roads and streets, and septic tank absorption fields.

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

Pm—Peotone silty clay loam, pothole. This deep, nearly level, very poorly drained soil is in depressions and potholes. It is frequently ponded by runoff from the adjacent areas. Areas generally are oval or round, but they can be irregular in shape. They are 3 to 40 acres in size. The dominant size is about 15 acres.

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 22 inches thick. The subsoil is about 20 inches thick. In sequence downward, it is gray, firm silty clay loam; light brownish gray, mottled, firm silty clay; and light gray, mottled, firm silty clay loam. The underlying material to a depth of about 60 inches is light brownish gray, mottled silty clay loam. In places the slope is more than 2 percent. In some small areas the underlying material is at a depth of more than 60 inches. In a few areas the dark surface soil is less than 24 inches thick. In some of these areas, loam or silt loam glacial till is in the underlying material. In many areas the dark surface soil is more than 36 inches thick.

Included with this soil in mapping are some small areas of the moderately well drained Barce and well drained Strawn soils on the more sloping parts of the landscape. Also included are a few areas of the poorly drained Drummer and Washtenaw soils and the very poorly drained Houghton, Wallkill Variant, and Warners Variant soils. Drummer soils are in the slightly higher areas. Houghton soils are deep mucks. They are in the slightly lower areas. Wallkill Variant soils are underlain by muck. Warners Variant soils have less clay in the subsoil than the Peotone soil. They are in the less concave areas. Included soils make up about 7 to 12 percent of the map unit.

The available water capacity of the Peotone soil is high. Permeability is moderately slow. The content of organic matter in the surface layer is high. Runoff is ponded or very slow. The water table is at or above the surface from late winter to early summer. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and hinder seedbed preparation.

Most areas of this soil are used for cultivated crops or wildlife habitat. Some areas are used as woodland.

This soil is fairly well suited to corn and soybeans. Ponding is a hazard. A cold soil temperature and a scarcity of suitable drainage outlets are limitations. The root zone is shallow because of excess water. The ponding limits the use of equipment, and machinery can bog down when the soil is wet. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. Small enclosed depressions can be drained by an open inlet pipe in conjunction with subsurface drains. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimize compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent crusting after periods of heavy rainfall. The soil is suited to fall chiseling, fall plowing, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Ponding is a hazard. Frost heaving is a limitation. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. The use of equipment is limited in ponded areas, and machinery can bog down when the soil is wet. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

The shrink-swell potential, low strength, and ponding severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by frost action, and improve the traffic-supporting capacity. Conveying runoff to suitable outlets helps to control ponding, lowers the seasonal high water table, and reduces the potential for frost action. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

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

Po—Piankeshaw Variant gravelly silt loam, rarely flooded. This deep, nearly level, well drained soil is on slight rises on flood plains. It is subject to rare flooding of brief or very brief duration. Areas generally are elongated and are 3 to 40 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsurface layer is dark brown extremely gravelly loam about 38 inches thick. The underlying material to a depth of about 60 inches is dark yellowish brown extremely gravelly sandy loam that has thin strata of gravelly loamy sand. In a few areas the soil has fewer rock fragments. In places it has less clay in the upper part.

Included with this soil in mapping are small areas of the very poorly drained Beaucoup soils in depressions. Also included are a few areas of the well drained Gosport and moderately well drained High Gap Variant soils on steep breaks. Gosport soils have more clay and fewer rock fragments than the Piankeshaw Variant soil. Included soils make up about 5 percent of the map unit.

The available water capacity of the Piankeshaw Variant soil is very low. Permeability is moderately rapid. The content of organic matter in the surface layer is moderately low. Runoff is slow. The surface layer is friable.

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

This soil is poorly suited to corn, soybeans, and small grain. Flooding and drought are hazards. Insufficient moisture causes droughtiness in summer. Rock fragments limit seedbed preparation. Fall-planted small grain is subject to severe damage during periods of prolonged flooding. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to spring plowing, spring chiseling, and no-till cropping systems.

This soil is fairly well suited to grasses and legumes, such as bromegrass and alfalfa, for hay and is well suited to pasture. Deep-rooted legumes and drought-tolerant species grow best. The flooding is a hazard. Insufficient moisture causes droughtiness in summer. The content of gravel in the surface layer, overgrazing, and grazing when the soil is too wet are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation and seedling mortality. In some years the rare flooding hinders harvesting and logging activities. The timber harvest should be delayed until dry periods or until the soil is frozen. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. The flooding, frost action, and large stones moderately limit the use of the soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by flooding and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The land capability classification is IVs. The woodland ordination symbol is 3F.

Pp—Pits, gravel. This deep, nearly level to gently sloping, somewhat poorly drained to well drained map unit is in depressions, along side slopes, and on ridgetops on terraces. Areas are generally square or rectangular and are 3 to 25 acres in size. The dominant size is about 4 acres.

A typical area is excavated to a depth of about 10 to 30 feet. Sand and gravelly sand are exposed. In some small areas woody shrubs and herbaceous plants grow where mining has terminated. In a few areas sandy loam and loam are exposed.

Included in this unit in mapping are some small areas of very poorly drained soils that have a seasonal high water table at or above the surface. These soils are in depressions. Also included, mainly at the edge of the map unit, are many small areas of steeper soils. Included soils make up about 10 to 14 percent of the map unit.

Most areas of this map unit are mined for sand and gravel. Some areas are used as wildlife habitat.

This map unit is generally unsuited to cultivated crops and is poorly suited to hay, pasture, and woodland. Soil blowing is a hazard. The seasonal high water table, droughtiness, very alkaline soil conditions, low fertility, large amounts of gravel, and cobbles and stones are limitations.

This map unit is not used as a site for dwellings, local roads and streets, or septic tank absorption fields because of its position on the landscape. If an area of the unit is used for urban development, onsite investigation is needed.

No land capability classification or woodland ordination symbol is assigned.

PrA—Proctor silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is along drainageways and on low rises and broad flats. Most areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark grayish brown silt loam about 3 inches thick. The subsoil is about 42 inches thick. In sequence downward, it is dark brown, friable silty clay loam; dark yellowish brown, mottled, friable silty clay loam; yellowish brown, mottled, friable loam; and yellowish brown, mottled, friable loam that has thin strata of sandy loam and loamy fine sand. The underlying material to a depth of about 60 inches is yellowish brown sandy loam that has thin strata of loamy sand and fine sand. In some places the lower part of the subsoil and the underlying material have more gravel. In other places the subsoil has more sand and less silt. In some areas, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is within a depth of 40 inches. In a few places the soil has a thinner surface layer. In some areas the lower part of the underlying material has glacial till. In a few areas the lower part of the suboil formed in glacial till. In places the soil is well drained.

Included with this soil in mapping are some small areas of the somewhat poorly drained Brenton soils in the lower positions. Also included, in depressions, are small areas of the poorly drained Drummer soils. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Proctor soil is high. Permeability is moderate in the upper part of the solum and moderate or moderately rapid in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 2.5 to 6.0 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, timely applications of nutrients, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The seasonal high water table and the shrink-swell potential moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

PrB2—Proctor silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is along drainageways, on low rises, and on ridgetops. Areas generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 20 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam mixed with dark yellowish brown silty clay loam from the subsoil. It is about 10 inches thick. The subsoil is about 39 inches thick. In sequence downward, it is dark yellowish brown and yellowish brown, friable silty clay loam; yellowish brown, mottled, friable clay loam; and yellowish brown, mottled, friable loam that has thin strata of sandy loam and loamy fine sand. The underlying material to a depth of about 60 inches is brown, mottled sandy loam that has thin strata of loam, loamy fine sand, and fine sandy loam. In some places the lower part of the subsoil and the underlying material have more gravel. In other places the subsoil has more sand and less silt. In some areas the slope is less than 2 percent or more than 6 percent. In some small areas the underlying material is within a depth of 40 inches. In a few places the surface layer is thinner. In some areas the lower part of underlying material has glacial till. In a few areas the lower part of the subsoil formed in glacial till.

Included with this soil in mapping are some areas of the somewhat poorly drained Brenton soils in the lower positions. Also included are small areas of the poorly drained Drummer soils in depressions and a few small areas of well drained soils. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Proctor soil is high. Permeability is moderate in the upper part of the solum and moderate or moderately rapid in the lower part and in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is medium. The water table is at a depth of 2.5 to 6.0 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, and a permanent cover of vegetation help to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste improve or help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The seasonal high water table and the shrink-swell potential moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets helps to prevent the damage caused by frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

PuA—Proctor silt loam, till substratum, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is in broad areas, on low rises, and along drainageways. Areas generally are irregular in shape and are about 45 acres in size. The size ranges from 3 to 100 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 35 inches thick. It is yellowish brown, friable silty clay loam in the upper part and yellowish brown, mottled, friable loam in the lower part. The upper part of the underlying material is brown, mottled sandy loam that has thin strata of loamy sand. The lower part to a depth of about 60 inches is light olive brown loam. In places, the slope is more than 2 percent and the soil is moderately eroded. In some small areas the underlying material is within a depth of 40 inches. In some areas the upper part of the underlying material has more sand and gravel. In a few places the soil has a thinner surface layer. In a few areas the underlying material is stratified and is sandy and loamy throughout. In some areas glacial till is throughout the underlying material, and in some of these areas the subsoil has more sand and less silt. In a few places the lower part of the underlying material is within a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and Millbrook soils in the slightly lower positions and a few areas of the poorly drained Drummer soils in depressions. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Proctor soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 2.5 to 3.5 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The seasonal high water table and shrinking and swelling moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets can minimize the damage caused by frost action.

The seasonal high water table and the moderately slow permeability in the lower part of the underlying material severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

PuB2—Proctor silt loam, till substratum, 2 to 6 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is along drainageways, on low rises, and on ridgetops. Areas generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 25 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam mixed with yellowish brown silty clay from the subsoil. It is about 10 inches thick. The subsoil is about 33 inches thick. It is yellowish brown and dark yellowish brown, friable silty clay loam in the upper part and yellowish brown, mottled, friable loam in the lower part. The upper part of the underlying material is yellowish brown, mottled sandy loam that has thin strata of loamy sand and loamy fine sand. The lower part to a depth of about 60 inches is light olive brown, mottled loam. In places the slope is less than 2 percent or more than 6 percent. In some small areas the underlying material is within a depth of 40 inches. In some areas the upper part of the underlying material has more sand and gravel. In a few places the surface layer is thinner. In a few areas the underlying material is stratified and is sandy and loamy throughout. In some areas glacial till is throughout the underlying material, and in some of these areas the subsoil has more sand and less silt. In places the soil is more eroded. In a few areas the lower part of the underlying material is within a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and Millbrook soils in the slightly lower positions and a few areas of the poorly drained Drummer soils in depressions. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Proctor soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is medium. The water table is at a depth of 2.5 to 3.5 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste improve or help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The seasonal high water table and the shrink-swell potential moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table and the moderately slow permeability in the lower part of the underlying material severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

Rb—Ragsdale silt loam. This deep, nearly level, very poorly drained soil is in broad, flat, low areas, in depressions, along and in narrow drainageways, and in swales. It is frequently ponded by runoff from the adjacent areas. Areas generally are irregular in shape, but some are long and narrow. Most are about 40 acres in size. The size ranges from 3 to 375 acres.

Typically, the surface layer is black silt loam about 8 inches thick. The subsurface layer is black silty clay loam about 6 inches thick. The subsoil is about 34 inches thick. It is grayish brown, mottled, firm silty clay loam in the upper part and light brownish gray, mottled, firm silty clay loam and silt loam in the lower part. The underlying material to a depth of about 60 inches is light brownish gray, mottled silt loam. In some areas the slope is more than 2 percent. In a few places the subsoil has more clay. In places the soil has more sand in the lower part of the subsoil and in the underlying material. In a few areas the underlying material is at a depth of less than 40 inches or more than 60 inches.

Included with this soil in mapping are small areas of the moderately well drained Iona and somewhat poorly drained Reesville soils on rises. These soils make up about 6 to 10 percent of the map unit.

The available water capacity of the Ragsdale soil is very high. Permeability is moderate. The content of organic matter in the surface layer is high. Runoff is ponded or very slow. The water table is at or above the surface from early winter to late spring. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The resulting clods are hard when dry, and they limit seedbed preparation.

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

This soil is well suited to corn, soybeans, and small grain. Ponding is a hazard. A cold soil temperature and the scarcity of suitable drainage outlets are limitations. The root zone is shallow because of excess water. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can help to remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. Ponding is a hazard. Frost heaving is a limitation. In ponded areas, the use of equipment is limited and machinery can bog down. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain tilth, increase plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be used only during dry periods or in winter. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Water-tolerant trees that have deep root systems grow best. Carefully thinning the stands, using special equipment that does not damage the surficial root system, and applying harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Alternative nearby sites should be considered.

Frost action, low strength, and ponding severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to control ponding and prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

RdA—Rainsville silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on low rises and broad, flat ridgetops in the uplands. Areas generally are irregular in shape and are about 20 acres in size. The size ranges from 3 to 45 acres.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 46 inches thick. In sequence downward, it is yellowish brown, friable silt loam and clay loam; dark yellowish brown and strong brown, mottled, friable sandy clay loam; and light olive brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled loam. In some places the upper part of the subsoil has less sand and more silt. In other places, the slope is more than 2 percent and the soil is moderately eroded. In a few areas the soil is well drained. In a few places the upper part of the subsoil has less clay and more sand. In some small areas depth to the underlying material is less than 45 inches or more than 60 inches. In a few places the soil has a darker surface layer. In a few areas the upper part of the underlying material is stratified and is sandy and loamy. In some areas the soil has silt loam glacial till in the underlying material.

Included with this soil in mapping are some small areas of the poorly drained Cyclone soils in depressions. Also included are the well drained Hennepin and Miami soils. Hennepin soils are on steep breaks, and Miami soils are on the more sloping parts of the landscape. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity of the Rainsville soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The water table is at a depth of 2.5 to 4.0 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Woodland management requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings. In addition, the seasonal high water table moderately limits the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage and lower the seasonal high water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength moderately limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material and strengthening or replacing the base material improve the traffic-supporting capacity. Crowning the roads, which improves drainage, and providing soil additives minimize the damage caused by low strength.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

RfB2—Rainsville-Williamstown-Rockfield silt loams, 2 to 6 percent slopes, eroded. These deep, gently sloping, moderately well drained soils are along drainageways, on long side slopes, in broad areas, and on rises, ridgetops, and knolls in the uplands. Areas generally are irregular in shape and are 80 acres in size. The size ranges from 3 to 250 acres. This map unit is about 45 percent Rainsville soil, 35 percent Williamstown soil, 15 percent Rockfield soil, and 5 percent other soils. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

Typically, the surface layer of the Rainsville soil is dark grayish brown silt loam mixed with dark yellowish brown silt loam from the subsoil. It is about 8 inches thick. The subsoil is about 40 inches thick. In sequence downward, it is dark yellowish brown, friable silt loam; yellowish brown, friable clay loam; dark brown and strong brown, mottled, friable loam; and olive brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In places the slope is less than 2 percent or more than 6 percent. In a few areas the soil is well drained. In a few places the upper part of the underlying material is stratified and is loamy and sandy. In a few areas the surface layer is darker. In some places the subsoil has less clay and more sand. In other places the soil is more eroded. In a few areas it has silt loam glacial till in the underlying material.

Typically, the surface layer of the Williamstown soil is dark grayish brown silt loam mixed with light yellowish brown silt loam from the subsoil. It is about 7 inches thick. The subsoil is about 28 inches thick. In sequence downward, it is light yellowish brown, friable silt loam; yellowish brown, friable clay loam; and yellowish brown, mottled, friable loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In places the slope is less than 2 percent or more than 6 percent. In some small areas depth to the underlying material is less than 30 inches or more than 40 inches. In some areas the soil has silt loam glacial till in the underlying material. In a few places the surface layer is darker. In some areas the soil is well drained. In other areas it is more eroded.

Typically, the surface layer of the Rockfield soil is dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 53 inches thick. It is yellowish brown, friable silty clay loam and clay loam in the upper part and yellowish brown and light olive brown, mottled, friable clay loam and loam in the lower part. The underlying material to a depth of about 80 inches is light olive brown, mottled loam. In places the slope is less than 2 percent or more than 6 percent. In some areas the upper part of the underlying material is stratified and is loamy and sandy. In a few areas the soil is well drained. In a few places silt loam glacial till is in the underlying material. In a few areas the underlying material has less clay and more sand and gravel. In some areas the soil is more eroded. In a few areas the subsoil does not have outwash material.

Included with these soils in mapping are some small areas of the poorly drained Cyclone soils in depressions. Also included are a few areas of the somewhat poorly drained Millbrook soils on the less sloping parts of the landscape; the well drained Hennepin, Miami, and Strawn soils on the steeper slopes; and a few areas of the somewhat poorly drained Wakeland Variant soils on flood plains at the base of slopes. Included soils make up about 5 percent of the map unit.

The available water capacity of the Rainsville, Williamstown, and Rockfield soils is high. Permeability is moderate in the upper part of the solum in the Rainsville and Rockfield soils and moderately slow in the lower part and in the underlying material. It is moderate in the solum of the Williamstown soil and moderately slow in the underlying material. The content of organic matter is moderately low or moderate in the surface layer of all three soils. Runoff is medium. From early winter to late spring, the water table in the Rainsville and Rockfield soils is at a depth of 2.5 to 4.0 feet and the one in the Williamstown soil is at a depth of 1.5 to 3.5 feet. The surface layer of all three soils is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

These soils are well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soils are well suited to no-till and ridge-till cropping systems (fig. 8).

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant

Figure 8.—No-till corn in an area of Rainsville-Williamstown-Rockfield silt loams, 2 to 6 percent slopes, eroded.

density and hardiness, and keep the pasture in good condition.

These soils are well suited to trees. Plant competition is moderate on the Williamstown soil. Seedlings grow well on all three soils if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the seasonal high water table moderately limit the use of these soils as sites for dwellings. The seasonal high water table severely limits the Williamstown soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Low strength severely limits the use of these soils as sites for local roads and streets. In addition, frost action severely limits the Rockfield soil. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets helps to prevent the damage caused by frost action. Crowning the roads, which improves drainage, and providing soil additives can minimize the damage caused by shrinking and swelling.

The moderately slow permeability in the underlying material and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

The land capability classification is IIe. The woodland ordination symbol is 5A in areas of the Rainsville and Williamstown soils and 8A in areas of the Rockfield soil.

RlA—Reesville silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is in flat, low areas, along and in drainageways, and on low rises. Most areas are irregular in shape and are 3 to 450 acres in size. The dominant size is about 30 acres.

Typically, the surface layer is grayish brown silt loam about 8 inches thick. The subsoil is about 34 inches thick. In sequence downward, it is dark yellowish brown, mottled, firm silty clay loam; light yellowish brown, mottled, firm and friable silt loam; and olive yellow, mottled, friable silt loam. The underlying material to a depth of about 60 inches is olive yellow, mottled silt loam. In a few places glacial till is within a depth of 60 inches. In several areas carbonates are at a depth of more than 55 inches. In a few areas the subsoil has more clay. In some places the soil has less silt and more sand in the lower part of the subsoil and in the underlying material. In other places the subsoil is dominantly gray. In a few areas the surface layer is darker. In places the solum is more than 60 inches thick.

Included with this soil in mapping are small areas of the well drained Alford and moderately well drained Iona soils on the higher rises. Also included are a few areas of the very poorly drained Ragsdale soils in depressions. Included soils make up about 6 to 12 percent of the map unit.

The available water capacity of the Reesville soil is very high. Permeability is moderate. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 1.0 to 2.5 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. The root zone is shallow because of excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can remove excess water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. The seasonal high water table and frost heaving are limitations. Surface drains, subsurface drains, or a combination of these can remove excess water. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation and plant competition. The seasonal high water table limits the use of equipment during wet periods. The equipment should be used only during dry periods or during periods when the soil is frozen. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table severely limits the use of this soil as a site for dwellings. Installing an adequate foundation drainage system helps to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. An alternative nearby site should be considered.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

RoA—Rockfield silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is along drainageways, in broad, flat areas, and on low rises and ridgetops. Most areas are irregular in shape and are 3 to 30 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 46 inches thick. In sequence downward, it is yellowish brown, friable silt loam, silty clay loam, and loam; yellowish brown, mottled, friable loam; and light yellowish brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light olive brown loam. In some places the upper part of the subsoil has more sand and less silt. In other places, the slope is more than 2 percent and the soil is moderately eroded. In a few areas the soil is well drained. In a few places the upper part of the underlying material is stratified and is sandy and loamy.

Included with this soil in mapping are some small areas of the poorly drained Cyclone soils in depressions. Also included are a few areas of the somewhat poorly drained Millbrook soils on the less sloping parts of the landscape and a few areas of the well drained Miami soils on the more sloping parts. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Rockfield soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is slow. The water table is at a depth of 2.5 to 4.0 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability in the lower part of the solum and in the underlying material and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

RoB2—Rockfield silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is along drainageways, in broad areas, and on rises, long side slopes, ridgetops, and knolls. Areas generally are irregular in shape and are about 30 acres in size. The size ranges from 3 to 65 acres.

Typically, the surface layer is brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 49 inches thick. In sequence downward, it is yellowish brown, friable silty clay loam; yellowish brown and brown, mottled, friable clay loam and sandy clay loam; and light olive brown, mottled, friable loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the upper part of the subsoil has more sand and less silt. In other places the slope is less than 2 percent or more than 6 percent. In a few areas the soil is well drained. In some areas it is more eroded. In a few areas the upper part of the underlying material is stratified and is sandy and loamy.

Included with this soil in mapping are some small areas of the poorly drained Cyclone soils in depressions. Also included are a few areas of the somewhat poorly drained Millbrook soils on the less sloping parts of the landscape and the well drained Miami soils on the more sloping parts. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Rockfield soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The water table is at a depth of 2.5 to 4.0 feet from early winter to early spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basements walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability in the lower part of the solum and in the underlying material and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

RpG—Rodman gravelly loam, 25 to 60 percent slopes. This deep, steep or very steep, excessively drained soil is along drainageways. Areas generally are elongated and narrow and are about 45 acres in size. The size ranges from 5 to 60 acres.

Typically, the surface layer is very dark grayish brown gravelly loam about 6 inches thick. The subsoil is brown, friable gravelly loam about 9 inches thick. The underlying material to a depth of about 60 inches is yellowish brown very gravelly coarse sand. In a few areas the underlying material is at a depth of more than 15 inches. In places the solum has more clay. In some areas bedrock is exposed on the lower parts of the slopes. In a few places the underlying material is loam glacial till.

Included with this soil in mapping are a few areas of the well drained Armiesburg Variant and very poorly drained Comfrey soils on the lower flood plains at the base of slopes and a few areas of somewhat poorly drained soils that have textures similar to those of the Rodman soil and are on the lower parts of toe slopes. Also included are a few areas of the well drained Boyer, Eldean, Mudlavia, Ockley, and Rush soils. Boyer soils are on the less sloping breaks. Eldean, Mudlavia, Ockley, and Rush soils are on flats on ridgetops. Included soils make up about 7 or 8 percent of the map unit.

The available water capacity of the Rodman soil is very low. Permeability is moderately rapid in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is rapid or very rapid. The surface layer is friable.

Most areas of this soil are used as woodland. Some areas are used as hayland, pasture, or cultivated crops.

This soil is generally unsuited to cultivated crops. Erosion, runoff, and drought are hazards. The slope is a major limitation.

This soil is generally unsuited to grasses and legumes for hay. It is poorly suited to pasture. Deep-rooted legumes and drought-tolerant species grow best. Bromegrass and alfalfa are the best suited forage species. Erosion and runoff are hazards. Operating some types of equipment on the steeper slopes can be hazardous. Insufficient moisture causes droughtiness in summer. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is poorly suited to trees. The main management concerns are the erosion hazard, the equipment limitation, and seedling mortality. Laying out logging roads, skid trails, and landings on gentle grades help to control runoff and erosion. The conservation practices needed to remove excess water are water bars, out-sloping road surfaces, culverts, and drop structures. In some areas yarding the logs uphill with a cable can minimize the use of crawler tractors and rubber-tired skidders. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities. The slope severely limits the use of the soil as a site for local roads and streets. Cutting and filling and constructing the roads on the contour help to overcome the slope.

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

RtA—Rush silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on broad flats, along drainageways, on low rises, and on ridgetops. Areas generally are irregular in shape and are about 25 acres in size. The size ranges from 3 to 150 acres.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 50 inches thick. In sequence downward, it is yellowish brown and brown, friable silt loam and silty clay loam; brown, friable loam and sandy clay loam; and dark brown, friable gravelly sandy loam. The underlying material to a depth of about 80 inches is yellowish brown gravelly loamy coarse sand. In places, the slope is more than 2 percent and the soil is moderately eroded. In a few areas the soil is moderately well drained. In some small areas the underlying material is at a depth of less than 55 inches or more than 80 inches. In a few areas it has loam glacial till. In some areas the upper part of the subsoil has more sand and less silt. In a few areas the subsoil has less clay. In some areas the lower part of the subsoil and the underlying material have less gravel.

Included with this soil in mapping are some small areas of the somewhat poorly drained Starks soils in the slightly lower positions. Also included are a few areas of the excessively drained Rodman soils on steep breaks. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Rush soil is high. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is slow. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

This soil is suitable as a site for septic tank absorption fields.

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

RtB2—Rush silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is in broad areas, along drainageways, and on rises, long side slopes, ridgetops, and knolls. Areas generally are irregular in shape and are about 20 acres in size. The size ranges from 3 to 50 acres.

Typically, the surface layer is brown silt loam mixed with yellowish brown silty clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 53 inches thick. In sequence downward, it is yellowish brown and brown, friable silty clay loam; brown and yellowish brown, friable sandy clay loam; and dark brown, friable gravelly sandy clay loam and gravelly sandy loam. The underlying material to a depth of about 80 inches is yellowish brown gravelly loamy coarse sand. In places the slope is less than 2 percent or more than 6 percent. In a few areas the soil is moderately well drained. In some small areas the underlying material is at a depth of less than 55 inches or more than 80 inches. In a few areas it has loam glacial till. In some areas the upper part of the subsoil has more sand and less silt. In other areas the soil is more eroded. In a few areas the subsoil has less clay. In some areas the soil has less gravel in the lower part of the subsoil and in the underlying material.

Included with this soil in mapping are some small areas of the somewhat poorly drained Starks soils in the slightly lower positions. Also included are a few areas of the excessively drained Rodman soils on steep breaks. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Rush soil is high. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways help to control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

This soil is suitable as a site for septic tank absorption fields.

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

Sb—Sable silty clay loam. This deep, nearly level, poorly drained soil is in broad, flat, low areas, in depressions, along and in narrow drainageways, and in swales. It is frequently ponded by runoff from the adjacent slopes. Areas generally are irregular in shape and about 250 acres in size. Some are long and narrow. The size ranges from 3 to 325 acres.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer also is black silty clay loam. It is about 5 inches thick. The subsoil is about 32 inches thick. It is dark gray, dark grayish brown, and grayish brown, mottled, firm silty clay loam in the upper part and light brownish gray, mottled, friable silty clay loam in the lower part. The underlying material to a depth of about 60 inches is light brownish gray, mottled silt loam. In places the slope is more than 2 percent. In some small areas the underlying material is at a depth of less than 35 inches or more than 60 inches. In some areas the lower part of the subsoil and the underlying material have more sand. In a few places the subsoil has less clay.

Included with this soil in mapping are some small areas of the somewhat poorly drained Ipava soils on low rises. These soils make up about 6 to 10 percent of the map unit.

The available water capacity of the Sable soil is very high. Permeability is moderate. The content of organic matter in the surface layer is high. Runoff is ponded or very slow. The water table is at or above the surface from late winter to late spring. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and hinder seedbed preparation.

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

This soil is well suited to corn, soybeans, and small grain. Ponding is a hazard. A cold soil temperature and a scarcity of suitable drainage outlets are limitations. The root zone is shallow because of excess water. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. Small enclosed depressions can be drained by an open inlet pipe in conjunction with subsurface drains. If drained, the soil warms up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow well. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Ponding is a hazard. Frost heaving is a limitation. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. Small enclosed depressions can be drained by an open inlet pipe in conjunction with subsurface drains. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, timely applications of nutrients, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Alternative nearby sites should be considered.

Frost action, low strength, and the ponding severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by low strength and frost action, and improve the traffic-supporting capacity. Conveying runoff to suitable outlets helps to control ponding and reduces the potential for frost action.

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

SeA—Shadeland Variant silt loam, 0 to 2 percent slopes. This moderately deep, nearly level, somewhat poorly drained soil is along narrow drainageways, in flat, low areas, and on low rises. Areas generally are irregular in shape and are about 40 acres in size. The size ranges from 3 to 170 acres.

Typically, the surface soil is grayish brown silt loam about 10 inches thick. The subsoil is about 19 inches thick. It is yellowish brown, mottled, firm silty clay loam and clay in the upper part and light olive brown, mottled, firm clay loam in the lower part. The underlying material is light brownish gray, mottled shaly silty clay about 5 inches thick. Below this is dark gray, partly weathered, thinly bedded shale that grades to unweathered shale at a depth of about 37 inches. In a few areas the subsoil has less sand and clay and more silt. In some places, the slope is more than 2 percent and the soil is moderately eroded. In other places the soil does not have bedrock within a depth of 40 inches. In some areas it has glacial till in the underlying material.

Included with this soil in mapping are a few small areas of the well drained High Gap and moderately well drained High Gap Variant soils on the more sloping parts of the landscape and a few areas of the well drained Gosport and Weikert Variant soils on steep breaks. Also included, in depressions, are areas of poorly drained soils that have textures similar to those of the Shadeland Variant soil. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Shadeland Variant soil is moderate. Permeability is moderately slow in the solum and moderately slow or slow in the underlying material. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The water table is at a depth of 1 to 2 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is a limitation. The root zone is shallow because of excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can remove the excess water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops improve or help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. The seasonal high water table and frost heaving are limitations. Surface drains, subsurface drains, or a combination of these can remove excess water. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation and plant competition. The seasonal high water table limits the use of equipment during wet periods. The timber harvest should be delayed until dry periods or until the soil is frozen. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

A thin layer of suitable soil material, lateral seepage of effluent on top of the bedrock, and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. The thin layer limits the amount of soil material available to filter liquid waste. Filling or mounding the absorption field with suitable material improves the capacity of the field to absorb effluent. Installing interceptor drains around the absorption field helps to lower the water table.

The land capability classification is IIw. The woodland ordination symbol is 6A.

SIA—Starks silt loam, till substratum, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is along narrow drainageways, in flat, low areas, and on low rises. Areas generally are irregular in shape and are about 25 acres in size. The size ranges from 3 to 85 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. In sequence downward, it is brown, mottled, friable silty clay loam; yellowish brown, mottled, firm silty clay loam; and yellowish brown, mottled, friable loam. The upper part of the underlying material is yellowish brown, mottled sandy loam that has thin strata of loamy sand, silt loam, and loam. The lower part to a depth of about 60 inches is light olive brown loam. In some places, the slope is more than 2 percent and the soil is moderately eroded. In other places the subsoil has more sand and less silt. In some small areas the underlying material is within a depth of 40 inches. In some areas the surface layer is darker. In a few of these areas, it is thicker. In places the underlying material is stratified and is sandy and loamy throughout.

Included with this soil in mapping are a few small areas of the moderately well drained Camden and Tuscola soils on slight rises. Also included are some areas of the poorly drained Cyclone soils in depressions and a few areas of the well drained Martinsville and Rush soils on the slightly higher or more sloping parts of the landscape. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Starks soil is high. Permeability is moderate in the solum and in the upper part of the underlying material and moderately slow in the lower part. The content of organic matter in the surface layer is moderately low or moderate. Runoff is slow. The water table is at a depth of 1 to 3 feet from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The seasonal high water table is a limitation. The root zone is shallow because of excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can remove excess water. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops improve or help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. The seasonal high water table and frost heaving are limitations. Surface drains, subsurface drains, or a combination of these can remove excess water. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table severely limits the use of this soil as a site for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

Sr—Stonelick-Moundhaven complex, frequently flooded. These deep, nearly level soils are along the Wabash River and its tributaries. They are on slight swells or natural levees on flood plains and generally are the closest soils to the river or the major channels. The soils are frequently flooded for very brief to long periods. The Stonelick soil is well drained, and the Moundhaven soil is somewhat excessively drained. Areas generally are elongated and are about 80 acres in size. The size ranges from 3 to 250 acres. The map unit is about 55 percent Stonelick soil, 35 percent Moundhaven soil, and 10 percent other soils. The soils occur as areas so intricately mixed or so small that mapping them separately was not practical.

Typically, the surface layer of the Stonelick soil is dark grayish brown loam about 9 inches thick. The upper part of the underlying material is dark grayish brown fine sandy loam and loam. The lower part to a depth of about 60 inches is dark brown and brown fine sandy loam that has thin lenses of very fine sand and loamy fine sand. In some areas the solum has more silt and less sand. In other areas the surface layer and underlying material are gravelly. In a few areas the solum has more clay. In places bedrock is within a depth of 60 inches. In a few areas the surface layer is darker.

Typically, the surface layer of the Moundhaven soil is dark grayish brown loamy fine sand about 8 inches thick. The upper part of the underlying material is dark yellowish brown and yellowish brown loamy sand that has thin strata of silt loam. The lower part to a depth of about 60 inches is yellowish brown and brown sand. In a few areas the surface layer is darker. In a few places bedrock is within a depth of 60 inches. In some areas the soil has more gravel.

Included with these soils in mapping are some small areas of the well drained Armiesburg Variant, Chatterton, Du Page, and Jules soils in the lower positions. Armiesburg Variant and Du Page soils have more clay than the Stonelick and Moundhaven soils, Chatterton soils have a darker surface layer, and Jules soils have more silt and less sand. Also included are the moderately well drained Beckville soils in the lower areas and a few areas of the well drained Hennepin soils on steep breaks. Hennepin soils have more clay than the Stonelick and Moundhaven soils. Included soils make up about 10 percent of the map unit.

The available water capacity is moderate in the Stonelick soil and low in the Moundhaven soil. Permeability is moderately rapid in the Stonelick soil and rapid in the Moundhaven soil. The content of organic matter is moderately low or moderate in the surface layer of both soils. Runoff is slow. The surface layer is very friable and can be easily tilled throughout a very wide range in moisture content.

Most areas of these soils are used for cultivated crops. Some areas are used as pasture, hayland, or woodland.

These soils are fairly well suited to corn and soybeans. Fall-planted small grain is subject to severe damage during periods of prolonged flooding. The hazards of flooding, soil blowing, and drought are the main management concerns. Planting short-season varieties of adapted crops can reduce the extent of flood damage. Late planting of crops also helps to prevent the crop loss or damage caused by floodwater. In some areas constructing dikes or water-retention structures can prevent flooding. Installing a surface drainage system allows for planting of longer season varieties of adapted crops. Cutbanks are unstable; therefore, using heavy equipment near open excavations is hazardous. Caution is needed.

The conservation practices that can help to control soil blowing are crop rotations that include grasses and legumes, windbreaks, critical area planting, stripcropping, cover crops and green manure crops, and a conservation tillage system that leaves all or part of the crop residue on the surface. A permanent cover of vegetation also helps to control soil blowing. Working the soils at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soils are well suited to spring plowing, spring chiseling, and no-till cropping systems.

These soils are well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow best. Droughtiness, flooding, and soil blowing are the main management concerns. A permanent cover of drought-resistant grasses and legumes helps to control soil blowing. Increased plant density also helps to control soil blowing. Overgrazing reduces plant density and hardiness. Overgrazing and grazing during wet periods cause surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are well suited to trees. The main management concerns are seedling mortality, the windthrow hazard, and plant competition. In some areas frequent flooding limits harvesting and logging activities and the planting of seedlings. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Planting containerized nursery stock or the larger seedlings reduces the seedling mortality rate. Pine trees, which have a deep taproot system, generally grow well on these soils. Certain harvest methods leave some mature trees to provide shade and protection for seedlings. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the flooding and a poor filtering capacity, these soils are generally unsuitable as sites for dwellings and sanitary facilities. Overcoming these limitations is generally not feasible. Better suited soils should be selected as sites for these uses.

The flooding severely limits the use of these soils as sites for local roads. Constructing the roads on raised, well compacted, suitable fill material, crowning the roads, constructing adequate roadside ditches, and installing culverts help to remove excess water. Levees help to control flooding.

The land capability classification is IIIw. The woodland ordination symbol is 4A in areas of the Stonelick soil and 4S in areas of the Moundhaven soil.

StB3—Strawn clay loam, 2 to 6 percent slopes, severely eroded. This deep, gently sloping, well drained soil is along drainageways and on high rises, side slopes, ridgetops, and knolls in the uplands. Areas generally are irregular in shape and are about 5 acres in size. The size ranges from 3 to 15 acres.

Typically, the surface layer is brown clay loam mixed with dark yellowish brown clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 14 inches thick. It is dark yellowish brown, firm clay loam in the upper part and yellowish brown, firm loam in the lower part. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the underlying material is silt loam glacial till. In other places the slope is less than 2 percent or more than 6 percent. In some small areas the underlying material is at a depth of less than 10 inches or more than 27 inches. In a few areas the surface layer has been mixed with the underlying material by plowing and is yellowish brown cloddy, calcareous clay loam. In some areas the upper part of the subsoil has more sand and gravel. In a few places the soil has gray mottles in the lower part. In some areas it is less eroded.

Included with this soil in mapping are some areas of the very poorly drained Peotone and poorly drained Washtenaw soils in depressions or potholes. Also included are some areas of the moderately well drained Williamstown soils on the less sloping parts of the landscape. Included soils make up about 3 to 5 percent of the map unit.

The available water capacity of the Strawn soil is moderate. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is medium. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

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

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods help to control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is suitable as a site for dwellings. Frost action and low strength moderately limit the use of the soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability severely limits the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste.

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

StC3—Strawn clay loam, 6 to 12 percent slopes, severely eroded. This deep, moderately sloping, well drained soil is along narrow drainageways and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas generally are irregular in shape and are about 5 acres in size. The size ranges from 3 to 60 acres.

Typically, the surface layer is brown clay loam mixed with yellowish brown clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 13 inches thick. It is yellowish brown, firm clay loam in the upper part and yellowish brown, firm loam in the lower part. The underlying material to a depth of about 60 inches is light olive brown loam. In places the slope is less than 6 percent or more than 12 percent. In some small areas the underlying material is at a depth of less than 10 inches or more than 27 inches. In a few small areas the surface layer has been mixed with the underlying material by plowing and is yellowish brown, cloddy, calcareous clay loam. In a few places the soil has gray mottles in the lower part. In a few areas the upper part of the subsoil has more sand and gravel. In some areas the underlying material is silt loam glacial till. In other areas the soil is less eroded.

Included with this soil in mapping are some small areas of the very poorly drained Peotone and poorly drained Washtenaw soils in depressions or potholes. Also included are some areas of the moderately well drained Williamstown soils on the more sloping parts of the landscape. Included soils make up about 3 to 5 percent of the map unit.

The available water capacity of the Strawn soil is moderate. Permeability is moderate in the solum and moderately slow in the underlying material. The content of organic matter in the surface layer is moderately low. Runoff is rapid. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is fairly well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and is well suited to pasture. Erosion and runoff are hazards. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The slope moderately limits the use of this soil as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Establishing diversions between lots and installing retaining walls also help to overcome the slope.

Frost action, low strength, and the slope moderately limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action. Cutting and filling and constructing the roads on the contour help to overcome the slope.

The moderately slow permeability severely limits the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste.

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

SyB—Symerton-Varna silt loams, 1 to 3 percent slopes. These deep, nearly level or gently sloping, moderately well drained soils are in broad areas, on low rises, and on ridgetops in the uplands. Areas are generally irregular in shape and are about 20 acres in size. The size ranges from 3 to 60 acres. This map unit is about 55 percent Symerton soil and 40 percent Varna soil. The soils occur as areas so intricately mixed or so small that mapping them separately was not practical.

In a typical profile, the surface layer of the Symerton soil is very dark gray silt loam about 8 inches thick. The subsurface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 39 inches thick. In sequence downward, it is dark yellowish brown, friable silty clay loam and firm clay loam; dark yellowish brown, mottled, firm clay loam; and yellowish brown, mottled, firm silty clay loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled silt loam. In some places the subsoil has less sand and more silt. In other places, the slope is more than 3 percent and the soil is moderately eroded. In some small areas the underlying material is at a depth of less than 30 inches or more than 50 inches. In a few places, the surface layer is lighter colored or thinner and the upper part of the subsoil has more clay. In many small areas the upper part of the underlying material is stratified and is sandy and loamy.

In a typical profile, the surface layer of the Varna soil is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is very dark brown silt loam about 4 inches thick. The subsoil is about 33 inches thick. It is dark yellowish brown, friable and firm silty clay loam in the upper part and light olive brown, mottled, firm silty clay and silty clay loam in the lower part. The underlying material to a depth of about 60 inches is light olive brown, mottled silt loam. In some places the subsoil has less sand and more silt. In other places, the slope is more than 3 percent and the soil is moderately eroded. In a few areas the surface layer is lighter colored or thinner.

Included with these soils in mapping are some small areas of the somewhat poorly drained Elliott and Williamsport soils on the lower and less sloping parts of the landscape. Also included are some areas of the poorly drained Drummer soils in depressions. Included soils make up about 5 to 12 percent of the map unit.

The available water capacity of the Symerton and Varna soils is high. Permeability is moderate in the upper part of the solum in the Symerton soil and moderately slow in the lower part and in the underlying material. It is moderately slow in the Varna soil. The content of organic matter is moderate in the surface layer of both soils. Runoff is slow. From late winter to late spring, the water table in the Symerton soil is at a depth of 3.5 to 6.0 feet and the one in the Varna soil is at a depth of 3.0 to 6.0 feet. The surface layer of both soils is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some areas are used for hay or pasture.

These soils are well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent excessive crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content.

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of these soils as sites for dwellings without basements. The seasonal high water table and the shrink-swell potential moderately limit the use of the soils as sites for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength severely limits the use of these soils as sites for local roads and streets. In addition, frost action severely limits the Varna soil. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

TuC2—Tuscola loam, till substratum, 6 to 12 percent slopes, eroded. This deep, moderately sloping, moderately well drained soil is along narrow drainageways and on slight rises, side slopes, ridgetops, and knolls near streams. Areas generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 25 acres.

In a typical profile, the surface layer is dark grayish brown loam mixed with dark yellowish brown loam from the subsoil. It is about 7 inches thick. The subsoil is about 40 inches thick. It is dark yellowish brown, yellowish brown, and brown, friable loam and clay loam in the upper part and brown, mottled, very friable sandy loam in the lower part. The upper part of the underlying material is pale brown, mottled sandy loam that has thin strata of fine sandy loam, loamy fine sand, and silt loam. The lower part to a depth of about 60 inches is yellowish brown, mottled loam. In some places the subsoil has less clay. In other places the slope is less than 6 percent or more than 12 percent. In a few areas the lower part of the subsoil does not have gray mottles. In some areas the soil does not have loam glacial till within a depth of 60 inches. In a few places the lower part of the subsoil formed in till. In a few areas the subsoil and the underlying material have more sand and gravel. In some areas the soil is more eroded. In other areas the surface layer and subsoil have more silt and less sand.

Included with this soil in mapping are some small areas of the somewhat poorly drained Starks soils and, on the less sloping parts of the landscape, somewhat poorly drained soils in which the texture of the subsoil is similar to that of the Tuscola soil. Also included are a few areas of the poorly drained Cyclone soils in depressions. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Tuscola soil is high. Permeability is moderate in the solum and moderately slow in the underlying glacial till. The content of organic matter in the surface layer is moderately low. Runoff is medium. The water table is at a depth of 2 to 4 feet from late winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table severely limits the use of this soil as a site for dwellings. The shrink-swell potential, the seasonal high water table, and the slope moderately limit the use of the soil as a site for dwellings without basements. An adequate foundation drainage system is needed to lower the water table. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage. The dwellings should be designed so that they conform to the natural slope of the land. In some areas land shaping is needed. Establishing diversions between lots and installing retaining walls also help to overcome the slope.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, and strengthening or replacing the base material improve the traffic-supporting capacity.

The seasonal high water table and the moderately slow permeability in the lower part of the underlying material severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

TwB2—Tuscola silt loam, till substratum, 2 to 6 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is in broad areas and on rises, ridgetops, and knolls near streams. Areas generally are irregular in shape and are about 25 acres in size. The size ranges from 3 to 80 acres.

In a typical profile, the surface layer is dark grayish brown silt loam mixed with yellowish brown loam from the subsoil. It is about 8 inches thick. The subsoil is about 41 inches thick. In sequence downward, it is yellowish brown, friable loam; brown, friable clay loam and loam; and brown, mottled, very friable sandy loam. The upper part of the underlying material is brown, mottled sandy loam that has thin strata of silt loam and loamy fine sand. The lower part to a depth of about 60 inches is yellowish brown, mottled loam. In some areas the slope is less than 2 percent or more than 6 percent. In a few places the lower part of the subsoil does not have gray mottles. In some areas the soil does not have loam glacial till within a depth of 60 inches. In a few areas the lower part of the subsoil formed in till. In a few places the subsoil and underlying material have more sand and gravel. In a few areas the soil is more eroded. In some areas the subsoil has more silt and less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Starks soils and, on the less sloping parts of the landscape, somewhat poorly drained soils in which the texture of the subsoil is similar to that of the Tuscola soil. Also included are a few areas of the poorly drained Cyclone soils in depressions. Included soils make up about 10 to 15 percent of the map unit.

The available water capacity of the Tuscola soil is high. Permeability is moderate in the solum and moderately slow in the underlying glacial till. The content of organic matter in the surface layer is moderately low. Runoff is medium. The water table is at a depth of 2.0 to 4.0 feet from late winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. The conservation practices that can help to control erosion are diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The seasonal high water table severely limits the use of this soil as a site for dwellings with basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soil as a site for dwellings without basements. An adequate foundation drainage system is needed to lower the water table. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser textured material helps to prevent structural damage. Excavating and then backfilling with suitable material, using expansion joints, and providing soil additives also help to prevent structural damage.

Low strength severely limits the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, and strengthening or replacing the base material improve the traffic-supporting capacity.

The seasonal high water table and the moderately slow permeability severely limit the use of this soil as a site for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

Ud—Udorthents, loamy. These deep, nearly level and gently sloping, somewhat poorly drained to well drained soils are in borrow areas on terraces and uplands. They are in excavations. Areas generally are irregular in shape and are about 40 acres in size. The size ranges from 3 to 350 acres.

Typically, the upper 24 to 36 inches is gravelly sandy loam. Below this to a depth of 48 to 72 inches is very gravelly sandy loam stratified with sand and gravelly coarse sand. In some areas loamy glacial till is at the surface.

Included with these soils in mapping are small areas of water and areas that are backfilled with rock, glass, metal, concrete, and cinders. Also included, mainly at the edge of the map unit, are many small areas of soils that are steeper than the Udorthents. Included areas make up about 8 to 15 percent of the map unit.

The available water capacity of the Udorthents is very low or low. Permeability is moderately rapid or rapid. The organic matter content is very low. Runoff is slow to medium. The water table is 2 to more than 6 feet below the surface from early winter to late spring. These soils are very friable and can be easily tilled when moist, but the surface layer becomes cloddy and hard to work if it is tilled when too wet.

Most areas support vegetation, mainly various grasses, such as fescue. A few areas support shrubs or small trees. Some areas have no vegetation. These soils are used mainly as wildlife habitat. Some areas are used for woodland, pasture, or cultivated crops.

These soils are generally poorly suited to corn, soybeans, and small grain. When precipitation is insufficient, they are very droughty. The exposed loamy glacial till is firm and alkaline. It is a severe limitation. Preparing a seedbed can be difficult. Cover crops, manure crops, animal waste, and a system of conservation tillage that leaves protective amounts of organic material on the surface and within the surface layer increase the organic matter content and the moisture content and maintain tilth, soil structure, water infiltration, and soil aeration.

These soils are fairly well suited to grasses and legumes, such as smooth bromegrass and birdsfoot trefoil, for hay and are well suited to pasture. In the wetter areas shallow-rooted crops grow better than deep-rooted legumes, such as alfalfa. Droughtiness inhibits the establishment of grasses and legumes. Special management practices are needed. An intensified fertility program in which organic residue or manure is incorporated into the soils is needed. Planting cover crops as soon as possible in exposed areas helps to control erosion. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

These soils are not used as sites for dwellings, local roads and streets, or septic tank absorption fields. Onsite investigation is needed if a specific area is to be used for building site development or onsite waste disposal.

No land capability classification or woodland ordination symbol is assigned.

Ur—Udorthents, loamy, reclaimed. These deep, nearly level to gently sloping, moderately well drained to excessively drained soils are in borrow areas on terraces. These areas are reclaimed excavations. They generally are irregular in shape and are about 15 acres in size. The size ranges from 3 to 90 acres.

Typically, the upper 24 to 36 inches is gravelly sandy loam. Below this to a depth of 48 to 72 inches is very gravelly loamy coarse sand that has strata of sand and gravelly coarse sand.

Included with these soils in mapping are small areas of water and some small areas of somewhat poorly drained soils on the lower parts of the landscape. The water table is near the surface of the somewhat poorly drained soils. Also included, mainly at the edge of the map unit, are many small areas of soils that are steeper than the Udorthents. Included areas make up about 3 to 10 percent of the map unit.

The available water capacity of the Udorthents is low. Permeability is moderately rapid or rapid. The content of organic matter in the surface layer is low. Runoff is slow or very slow. The water table is at a depth of 4 to more than 6 feet in spring. The surface layer is very friable and can be easily tilled under proper moisture conditions.

Most areas support vegetation, mainly small grain. A few areas support shrubs, small trees, or herbaceous plants. Some areas have no vegetation. In a few places the underlying material is exposed. These soils are used mainly for cultivated crops. Some areas are used as habitat for wildlife.

These soils are poorly suited to corn and soybeans and are fairly well suited to wheat. Soil blowing and drought are hazards. In some areas a large amount of gravel and cobblestones is on the surface. Insufficient moisture causes droughtiness in summer. The conservation practices that can help to control soil blowing are windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, stripcropping, cover crops and green manure crops, tillage methods that leave the surface rough, or a permanent cover of vegetation. Ridging at an angle to the prevailing wind also helps to control soil blowing. Fall-seeded and early maturing crops can make good use of the limited amount of available water. Working the soils at the correct moisture content helps to minimize surface compaction and maintain soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content.

These soils are well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Deep-rooted legumes and drought-tolerant species grow well. Soil blowing and drought are hazards. Insufficient moisture causes droughtiness in summer. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of drought-resistant grasses and legumes and increased plant density help to control soil blowing. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

These soils are not used as sites for dwellings, local roads and streets, or septic tank absorption fields. Onsite investigation is needed if a specific area is to be used for building site development or onsite waste disposal.

No land capability classification or woodland ordination symbol is assigned.

Wc—Wakeland Variant silt loam, occasionally flooded. This deep, nearly level, somewhat poorly drained soil is on low bottom land and in old stream channels. It is occasionally flooded for very brief periods. Areas generally are elongated and are about 30 acres in size. Some areas are irregular in shape. The size ranges from 3 to 70 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, mottled, very friable silt loam about 25 inches thick. The upper part of the underlying material is gray, mottled silt loam. The lower part to a depth of about 60 inches is dark grayish brown, mottled very fine sandy loam. In places the slope is more than 2 percent. In many small areas the soil has more sand and clay throughout. In some areas the surface layer is thicker.

Included with this soil in mapping are some small areas of the moderately well drained Beckville soils on the higher parts of the landscape. Also included, on the higher parts of the uplands, are a few areas of the well drained Miami and moderately well drained Williamstown soils. Included soils make up about 8 to 10 percent of the map unit.

The available water capacity of the Wakeland Variant soil is high. Permeability is moderate in the solum and in the upper part of the underlying material and moderately rapid in the lower part of the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 1.0 to 3.0 feet from early winter to spring. The surface layer is very friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn and soybeans. Flooding and the seasonal high water table are the main management concerns. Fall-planted small grain is subject to severe damage during periods of flooding.

Planting short-season varieties of adapted crops can reduce the extent of flood damage. Late planting of crops also helps to prevent the crop loss or damage caused by floodwater. Installing a surface drainage system allows for planting of longer season varieties of adapted crops. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to a ridge-till cropping system.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. Flooding is a major hazard, and the seasonal high water table and frost heaving are limitations. Installing a surface drainage system helps to remove excess water and minimizes the damage caused by frost heaving. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. In some years flooding hinders harvesting and logging activities and the planting of seedlings. The seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the flooding and the seasonal high water table, this soil is generally unsuitable as a site for dwellings and sanitary facilities.

Flooding and frost action severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water and help to prevent the damage caused by frost action. Levees help to control flooding. Conveying runoff to suitable outlets helps to remove excess water and reduces the potential for frost action.

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

We—Wallkill Variant silty clay loam. This deep, nearly level, very poorly drained soil is along and in narrow drainageways, in flat, low areas, in depressions, and in swales. It is frequently ponded by runoff from the adjacent slopes. Areas generally are irregular in shape and are about 10 acres in size. The size ranges from 3 to 25 acres.

In a typical profile, the surface layer is very dark grayish brown silty clay loam about 9 inches thick. The subsurface layer is black silty clay loam about 22 inches thick. It is mottled in the lower part. The underlying material to a depth of about 60 inches is very dark gray and dark brown muck. In places the slope is more than 2 percent. In some small areas the underlying organic material is at a depth of less than 16 inches or more than 40 inches. In a few places the soil has less clay in the upper part. In some small areas the lower part of the underlying material has sandy material, loamy material, marl, or a mixture of these.

Included with this soil in mapping are some small areas of the very poorly drained Peotone, Houghton, and Warners Variant soils. These soils are in the more concave areas. Peotone and Warners Variant soils formed in mineral material and are not underlain by organic material. Houghton soils formed in deep organic deposits. Also included are a few areas of somewhat poorly drained soils at the edge of the map unit. Included soils make up about 4 to 8 percent of the map unit.

The available water capacity of the Wallkill Variant soil is very high. Permeability is moderately slow in the mineral layers and moderately slow to moderately rapid in the organic layers. The content of organic matter in the surface layer is high or very high. Runoff is ponded or very slow. The water table is at or above the surface from late winter to late spring. The surface layer is friable, but it becomes cloddy and hard to work if tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

Most areas are used for cultivated crops. This soil is fairly well suited to corn, soybeans, and small grain. Ponding and burning of the organic material are hazards. A cold soil temperature, a scarcity of suitable drainage outlets, and subsidence of the organic material after drainage are limitations. The root zone is shallow because of excess water. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. If the water table is controlled, the rate of oxidation slows down. If the soil is overdrained, however, the rate increases. The muck is unstable. If drainage outlets are available, surface drains, subsurface drains, pumps, or a combination of these can help to lower the water table. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. If drained, the soil can warm up earlier in spring. A drainage system improves the stability of the muck.

Working the soil at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Ponding and burning of the organic material are hazards. Frost heaving is a limitation. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. In ponded areas, the use of equipment is limited and machinery can bog down. Surface drains, subsurface drains, pumps, or a combination of these can help to lower the water table. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of low strength and ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Frost action, low strength, and ponding severely limit the soil as a site for local roads. Removing the unstable material and constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by low strength and frost action, and improve the traffic-supporting capacity. Pilings are needed to strengthen the roadbed. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

Wg—Warners Variant silty clay, drained. This deep, nearly level, very poorly drained soil is in low areas and depressions. It is frequently ponded by runoff from the adjacent slopes. Areas generally are irregular in shape and are about 10 acres in size. The size ranges from 3 to 15 acres.

In a typical profile, the surface layer is very dark brown silty clay about 9 inches thick. The subsurface layer is black silty clay about 7 inches thick. The subsoil is gray and grayish brown, mottled, firm silty clay loam about 19 inches thick. The upper part of the underlying material is light brownish gray, mottled marl. The lower part to a depth of about 60 inches is grayish brown, mottled fine sandy loam that has thin strata of silt loam. In some areas the underlying material is loam, silt loam, or silty clay loam glacial till. In some areas the solum has more clay. In a few areas coprogenous earth is in the underlying material. In places the marl extends below a depth of 60 inches.

Included with this soil in mapping are some areas of the very poorly drained Houghton, Milford, Peotone, and Wallkill Variant soils. Houghton, Milford, and Peotone soils are in the more concave areas. Houghton soils formed in deep deposits of organic material. Milford and Peotone soils have more clay than the Warners Variant soil. Wallkill Variant soils are in the less concave areas. They are underlain by organic material. Also included are a few areas of somewhat poorly drained soils at the edge of the map unit. Included soils make up about 3 to 8 percent of the map unit.

The available water capacity of the Warners Variant soil is high. Permeability is moderately slow or slow in the solum and moderately rapid in the lower part of the underlying material. The content of organic matter in the surface layer is high or very high. Runoff is ponded or very slow. The water table is at or above the surface from early winter to early summer. The surface layer is friable, but it becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and make seedbed preparation difficult.

Most areas are used for cultivated crops or wildlife habitat. This soil is fairly well suited to corn, soybeans, and small grain. Ponding is a hazard. A cold soil temperature and a scarcity of suitable drainage outlets are limitations. The root zone is shallow because of excess water. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing green manure crops help to maintain soil structure, tilth, water infiltration, and soil aeration and prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Ponding is a hazard. Frost heaving is a limitation. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. In ponded areas, the use of equipment is limited and machinery can bog down. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

Frost action and the ponding severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, constructing adequate roadside ditches, installing culverts, and conveying runoff to suitable outlets help to prevent the damage caused by ponding and frost action.

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

Wh—Washtenaw silt loam. This deep, nearly level, poorly drained soil is in broad, low areas, in depressions, along and in narrow drainageways, and in swales on uplands. It is frequently ponded by runoff from the adjacent slopes. Areas generally are irregular in shape and are about 15 acres in size. Some areas are long and narrow. The size ranges from 3 to 40 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The underlying material is dark grayish brown, mottled silt loam about 14 inches thick. Below this is a buried surface layer of very dark gray silty clay loam about 14 inches thick. The buried subsoil is dark gray and gray, mottled, firm silty clay loam about 14 inches thick. The buried underlying material to a depth of about 60 inches is gray, mottled silty clay loam. In some places the slope is more than 2 percent. In other places the buried layers have more clay. Some areas have less than 20 inches or more than 40 inches of overwash. In some areas the soil has more sand and less silt in the upper part.

Included with this soil in mapping are some small areas of the well drained Miami and Strawn soils in the more sloping positions and small areas of the very poorly drained Milford and Peotone soils on the more concave parts of the landscape. Milford and Peotone soils have more clay than the Washtenaw soil. Also included, on low rises, are a few areas of somewhat poorly drained soils that have textures similar to those of the Washtenaw soil. Included soils make up about 6 to 10 percent of the map unit.

The available water capacity of the Washtenaw soil is very high. Permeability is moderate in the upper part of the profile and slow in the lower part. The content of organic matter in the surface layer is moderate or high. Runoff is ponded or very slow. The water table is at or above the surface from early winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Ponding is a hazard. A cold soil temperature and a scarcity of suitable drainage outlets are limitations. The root zone is shallow because of excess water. In ponded areas, the use of equipment is limited and machinery can bog down. Puddling and crusting are problems. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. An open inlet pipe in conjunction with subsurface drains can drain small enclosed depressions. If drained, the soil can warm up earlier in spring. Working the soil at the correct moisture content helps to control puddling, minimize surface compaction, and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent excessive crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Water-tolerant species grow best. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. Ponding is a hazard. Frost heaving is a limitation. In ponded areas, the use of equipment is limited and machinery can bog down. Surface drains, subsurface drains, pumps, or a combination of these can remove excess water. Small enclosed depressions can be drained by an open inlet pipe in conjunction with subsurface drains. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be used only during dry periods or in winter. Planting more trees than necessary can compensate for seedling mortality, but thinning may be needed after a stand is established. Water-tolerant trees that have deep root systems grow best. Carefully thinning the stands, using special equipment that does not damage the surficial root system, and applying harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. An alternative nearby site should be considered.

Frost action and the ponding severely limit the use of this soil as a site for local roads. Constructing the roads on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to remove excess water, prevent the damage caused by frost action, and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the hazard of ponding and the potential for frost action.

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

WIA—Waupecan silt loam, moderately wet, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is along drainageways, in broad, flat areas, and on low rises and ridgetops. Areas generally are irregular in shape and are about 20 acres in size. The size ranges from 3 to 80 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 50 inches thick. In sequence downward, it is dark yellowish brown and yellowish brown, friable silty clay loam; yellowish brown, mottled, friable loam; brown, mottled, very friable sandy loam; and yellowish brown, mottled, very friable gravelly sandy loam. The underlying material to a depth of about 80 inches is brown very gravelly coarse sand. In places the subsoil has more sand and less silt. In a few areas the surface is lighter colored or thinner. In some areas, the slope is more than 2 percent and the soil is moderately eroded. In a few places the lower part of the subsoil and the underlying material have less gravel. In some areas the lower part of the solum is browner. In a few areas the subsoil has less clay.

Included with this soil in mapping are some small areas of the somewhat poorly drained Lafayette soils in the slightly lower positions. Also included are a few areas of the very poorly drained Comfrey soils on the lower flood plains. Included soils make up about 4 to 7 percent of the map unit.

The available water capacity of the Waupecan soil is high. Permeability is moderate in the solum and very rapid in the underlying material. The content of organic matter in the surface layer is moderate. Runoff is slow. The water table is at a depth of 3 to 6 feet from late winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

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

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent surface crusting after periods of heavy rainfall. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops and green manure crops, and applications of animal waste improve or help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soil is well suited to no-till and ridge-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The shrink-swell potential moderately limits the use of this soil as a site for dwellings without basements. The shrink-swell potential and the seasonal high water table moderately limit the use of the soil as a site for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

The seasonal high water table severely limits the use of this soil as a site for septic tank absorption fields. Installing perimeter drains around the absorption fields helps to lower the water table.

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

WpG—Weikert Variant fine sandy loam, 35 to 80 percent slopes, very bouldery. This moderately deep, very steep, well drained soil is on the sides of draws and on bedrock terrace breaks along rivers and creeks. Sandstone fragments 10 to 25 inches in diameter cover about 10 percent of the surface. Areas are mainly elongated and are about 55 acres in size. Some are irregular in shape. The size ranges from 5 to 70 acres.

In a typical profile, the surface layer is dark brown fine sandy loam about 5 inches thick. The subsoil is about 22 inches thick. It is dark yellowish brown, friable channery fine sandy loam in the upper part and yellowish brown, friable channery sandy loam in the lower part. Yellowish brown, weathered sandstone that easily parts to sandy loam is at a depth of about 27 inches. Hard, unweathered sandstone bedrock is at a depth of about 34 inches. In places partly weathered sandstone is at a depth of about 31 inches. In some small areas the bedrock is below a depth of 40 inches. In places the subsoil formed in glacial drift, and in some of these places glacial till is in the underlying material. In a few areas the soil formed in shale residuum and has less sand and more clay throughout.

Included with this soil in mapping are some areas of the well drained High Gap and somewhat poorly drained Shadeland Variant soils in the less sloping positions near steep breaks and scattered areas of soils that have bedrock near or above the surface. High Gap soils have more clay in the solum than the Weikert Variant soil. Also included, at the upper end of drainageways, are many areas where slopes are less than 25 percent. Included soils make up about 10 percent of the map unit.

The available water capacity of the Weikert Variant soil is low. Permeability is moderately rapid. The content of organic matter in the surface layer is moderately low or moderate. Runoff is rapid or very rapid. The surface layer is friable.

Most areas of this soil are used as woodland. A few areas are used for pasture.

This soil is generally unsuited to corn, soybeans, and small grain. Erosion and runoff are hazards. The slope is the major limitation.

This soil is generally unsuited to grasses and legumes for hay and is poorly suited to pasture. Bromegrass and alfalfa grow well. Erosion, droughtiness, and runoff are hazards. The use of equipment can be hazardous on the steeper slopes. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of drought-resistant grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is poorly suited to trees. The main management concerns are the erosion hazard, the equipment limitation, the windthrow hazard, and plant competition. Laying out logging roads, skid trails, and landings on gentle grades helps to control erosion. Water bars, out-sloping road surfaces, culverts, and drop structures can help to remove excess water. In some areas yarding the logs uphill with a cable or other special logging methods are needed to minimize the use of crawler tractors and rubber-tired skidders. Careful thinning, using special equipment that does not damage the surficial root system, and applying harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities. The slope severely limits the use of the soil as a site for local roads. Cutting and filling and constructing the roads on the contour help to overcome the slope.

The land capability classification is VIIe. The woodland ordination symbol is 6R.

WrA—Williamsport-Elliott silt loams, 0 to 2 percent slopes. These deep, nearly level, somewhat poorly drained soils are in flat, low areas, along and in drainageways, and on low rises. Areas generally are irregular in shape and are about 80 acres in size. The size ranges from 3 to 400 acres. This map unit is about 50 percent Williamsport soil and 30 percent Elliott soil. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

In a typical profile, the surface layer of the Williamsport soil is very dark gray silt loam about 8 inches thick. The subsurface layer also is very dark gray silt loam. It is about 3 inches thick. The subsoil is about 40 inches thick. In sequence downward, it is dark brown, mottled, friable silty clay; brown, mottled, friable silty clay loam; yellowish brown, mottled, friable loam; and 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 many places the solum has more sand and less silt. In some areas, the slope is more than 2 percent and the soil is moderately eroded. In many areas the solum has less clay. In a few places the lower part of the subsoil has less sand. In some areas the underlying material is at a depth of more than 60 inches. In other areas the upper part of the underlying material is stratified and is sandy and loamy.

In a typical profile, the surface layer of the Elliott soil is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 32 inches thick. It is dark yellowish brown, mottled, firm silty clay loam in the upper part and light olive brown, mottled, firm silty clay and silty clay loam in the lower part. The underlying material to a depth of about 60 inches is light olive brown, mottled silty clay loam. In places the solum has less sand and more silt. In some small areas the upper part of the subsoil has less clay and more sand. In some areas, the slope is more than 2 percent and the soil is moderately eroded. In other areas the upper part of the underlying material is stratified and is sandy and loamy. In a few areas the surface layer is thinner.

Included with these soils in mapping are a few small areas of the moderately well drained Markham, Symerton, and Varna soils on slight rises and on the higher parts of the landscape. Also included are some areas of the poorly drained Drummer soils in depressions. Included soils make up about 20 percent of the map unit.

The available water capacity is high in the Williamsport and Elliott soils. Permeability is moderate in the upper part of the solum in the Williamsport soil and moderately slow in the lower part and in the underlying material. It is moderately slow in the Elliott soil. The content of organic matter is moderate or high in the surface layer of both soils. Runoff is slow. The water table is at a depth of 1 to 3 feet from winter to late spring. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some areas are used for hay or pasture.

These soils are well suited to corn, soybeans, and small grain. Excess water is a limitation. The root zone is shallow because of the excess water. Crusting is a problem. Surface drains, subsurface drains, or a combination of these can remove the excess water. Working the soils at the correct moisture content helps to minimize surface compaction and maintain soil structure. Applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and growing cover crops and green manure crops help to maintain soil structure, tilth, water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soils are well suited to fall chiseling and ridge-till cropping systems.

These soils are well suited to grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted legumes. The seasonal high water table and frost heaving are limitations. Surface drains, subsurface drains, or a combination of these can remove excess water. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, reduced forage yields, damage to the sod, and reduced plant density and hardiness. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

The seasonal high water table severely limits the use of these soils as sites for dwellings. An adequate foundation drainage system is needed to lower the water table. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table.

Frost action and low strength severely limit the use of these soils as sites for local roads and streets. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base material, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets helps to prevent the damage caused by frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

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

WtC2—Williamstown-Rainsville silt loams, 6 to 12 percent slopes, eroded. These deep, moderately sloping, moderately well drained soils are along drainageways, on long side slopes, in broad areas, and on rises, ridgetops, and knolls in the uplands. Most areas are irregular in shape and are about 30 acres in size. The size ranges from 3 to 160 acres. This map unit is about 60 percent Williamstown soil and 30 percent Rainsville soil. The soils occur as areas so intricately mixed or so small that it was not practical to separate them in mapping.

In a typical profile, the surface layer of the Williamstown soil is brown silt loam mixed with dark yellowish brown clay loam from the subsoil. It is about 7 inches thick. The subsoil is about 27 inches thick. It is dark yellowish brown, friable clay loam in the upper part and yellowish brown, mottled, friable loam in the lower part. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some places the subsoil has less sand and more silt. In other places slopes are less than 6 percent or more than 12 percent. In many small areas the underlying material is within a depth of 30 inches. In places it is silt loam glacial till. In some areas the soil is well drained. In other areas it is more eroded.

In a typical profile, the surface layer of Rainsville soil is brown silt loam mixed with yellowish brown clay loam from the subsoil. It is about 8 inches thick. The subsoil is about 38 inches thick. In sequence downward, it is yellowish brown, friable clay loam and loam; brown, mottled, friable sandy clay loam; and dark yellowish brown, mottled, firm loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some areas slopes are less than 6 percent or more than 12 percent. In a few areas the soil is well drained. In a few places the upper part of the underlying material is stratified and is loamy and sandy. In some places the subsoil has less clay and more sand. In other places the soil is more eroded. In a few areas silt loam glacial till is in the underlying material. In some areas the upper part of the subsoil has more silt and less sand.

Included with these soils in mapping are some small areas of the well drained Hennepin, Miami, and Strawn soils. Hennepin soils are on steep breaks. Miami and Strawn soils are in the more sloping areas. Also included are some areas of somewhat poorly drained soils that have textures similar to those of the Williamstown and Rainsville soils and are in the slightly lower positions, a few areas of the poorly drained Cyclone soils in depressions, a few small areas of the somewhat poorly drained Wakeland Variant soils on the lower flood plains at the base of slopes, and small areas of well drained and moderately well drained, severely eroded soils on the steeper slopes. Included soils make up about 5 to 10 percent of the map unit.

The available water capacity is high in the Williamstown and Rainsville soils. Permeability is moderate in the solum of the Williamstown soil and moderately slow in the underlying material. It is moderate in the upper part of the solum in the Rainsville soil and moderately slow in the lower part and in the underlying material. The content of organic matter is moderately low or moderate in the surface layer of both soils. Runoff is medium. From early winter to late spring, the water table in the Williamstown soil is at a depth of 1.5 to 3.5 feet and the one in the Rainsville soil is at a depth of 2.5 to 4.0 feet. The surface layer is friable and can be easily tilled under proper moisture conditions.

Most areas of these soils are used for cultivated crops. Some areas are used as hayland, pasture, or woodland.

These soils are fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, stripcropping, cover crops and green manure crops, crop rotations that include grasses and legumes, drop structures, grade stabilization structures, or a combination of these can help to control erosion. A permanent cover of vegetation also helps to control erosion. Grassed waterways can control erosion in drainageways. A cropping system that includes close-growing crops reduces the hazard of erosion. Working the soils at the correct moisture content helps to minimize surface compaction and maintain soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent surface crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, water infiltration, soil aeration, the moisture content, and the organic matter content. The soils are well suited to no-till and ridge-till cropping systems.

These soils are well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, which results in poor tilth, excessive runoff, reduced forage yields, damage to the sod, and reduced plant density and hardiness. A permanent cover of grasses and legumes helps to control runoff and erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and shorter rotational grazing periods in summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

These soils are well suited to trees. Plant competition is moderate on the Williamstown soil. Seedlings grow well if plow planting, proper site preparation, spraying, cutting, furrowing, girdling, and special harvest methods control competing vegetation. Woodland management also requires excluding livestock, harvesting mature trees, and saving desirable seed trees.

The shrink-swell potential and the slope moderately limit the use of these soils as sites for dwellings without basements. In addition, the seasonal high water table in the Williamstown soil is a moderate limitation on sites for dwellings without basements and a severe limitation on sites for dwellings with basements, and the seasonal high water table, slope, and shrink-swell potential of the Rainsville soil are moderate limitations on sites for dwellings with basements. Foundations, footings, and basement walls should be strengthened. Installing foundation drains, excavating and then backfilling with suitable material, using expansion joints, and providing soil additives help to prevent structural damage. Constructing the dwellings on raised, well compacted, suitable fill material increases the depth to the water table. The dwellings should be designed so that they conform to the natural slope of the land. In some areas land shaping is needed. Establishing diversions between lots and installing retaining walls also help to overcome the slope. The dwellings should be constructed without basements.

Low strength and frost action severely limit the use of the Williamstown soil as a site for local roads and streets, and low strength severely limits the Rainsville soil. Constructing the roads and streets on raised, well compacted, suitable fill material, strengthening or replacing the base with better suited material, constructing adequate roadside ditches, and installing culverts can minimize the damage caused by frost action and low strength and improve the traffic-supporting capacity. Conveying runoff to suitable outlets reduces the potential for frost action.

The moderately slow permeability and the seasonal high water table severely limit the use of these soils as sites for septic tank absorption fields. Enlarging the absorption fields and using a holding tank help to compensate for the restricted permeability and reduce the content of solids in the liquid waste. Installing perimeter drains around the absorption fields helps to lower the water table.

The land capability classification is IIIe. 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 expenditure 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 192,427 acres in Warren County, or nearly 82 percent of the total acreage, meets the soil requirements for prime farmland.

A trend in land use in some parts of the county has been the loss of some prime farmland to 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 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 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

Gregory P. Hofmeister, 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 rarely 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.

According to the Agricultural Stabilization and Conservation Service, about 201,200 acres in Warren County was used for crops and pasture in 1986. Of this total, about 138,400 acres was used for row crops, mainly corn and soybeans; 19,000 acres for permanent pasture; 9,100 acres for close-growing crops, mainly wheat and oats; and 16,600 acres for rotation hay and pasture or for specialty crops, such as kidney beans and sweet corn. About 18,100 acres was idle cropland used for conservation purposes.

The field crops suited to the soils and climate of Warren County include some that are rarely grown. Corn, soybeans, and wheat are the main crops. Oats and rye are grown to a limited extent. Hay or seed can be produced from bromegrass, fescue, redtop, and bluegrass.

The potential of the soils in Warren County for increased production of food is fair. A few thousand acres of potentially good cropland currently is used as woodland or pasture. In addition to the reserve productive capacity represented by this land, extending the latest crop production technology to all of the cropland in the county can increase food production. This soil survey can greatly facilitate the application of such technology.

The paragraphs that follow describe the main concerns in managing the soils in the county for crops and pasture. These concerns are wetness, soil blowing, water erosion, fertility, and tilth.

Wetness is the major problem on about 45 percent of the cropland and pasture in Warren County. Most of the poorly drained soils, such as Cyclone, Drummer, and Sable soils, are sufficiently drained for agricultural production. A few areas of Houghton and Peotone soils, however, cannot be economically or adequately drained. These are depressional areas where suitable outlets are available only if drainage ditches are deep and extend for great distances. Unless artificially drained, somewhat poorly drained soils, such as Brenton, Gilboa, and Starks soils, are so wet that crops are damaged in most years.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface and subsurface drains is needed in most areas of the very poorly drained, poorly drained, and somewhat poorly drained soils that are intensively row cropped. The drains should be more closely spaced in moderately slowly or slowly permeable soils than in the more permeable soils. Subsurface drainage is moderately slow in Wallkill Variant and Elliott soils. Adequate outlets for subsurface drainage systems are not readily available in some areas of Houghton, Milford, Peotone, and Warners Variant soils.

Houghton and other organic soils oxidize and subside when their pore space is filled with air. Therefore, special drainage systems are needed to control the depth and period of drainage. Lowering the water table to the level required by the crops during the growing season and raising it to the surface during other parts of the year can minimize the oxidation and subsidence of these soils.

Further information about the design of drainage systems for each kind of soil is in the Technical Guide, which is available in local offices of the Soil Conservation Service.

Soil blowing is a major problem on about 4 percent of the cropland in Warren County. It is a hazard on soils that have a coarse textured or moderately coarse surface layer, such as Billett and Ormas soils, and on soils that have a finer textured surface layer, especially if the surface is bare. Soils that are plowed in fall are susceptible to soil blowing in spring. Soil blowing can remove many tons of topsoil per acre per year and can damage emerging crops. Control of soil blowing minimizes the loss of surface soil and the deposition of soil material in ditches, on roadways, in fence rows, and behind windbreaks. It also reduces the amount of sediment entering streams. Soil blowing can be controlled by windbreaks, a system of conservation tillage that leaves protective amounts of crop residue on the surface, buffer strips, vegetative barriers, cover crops, and green manure crops. Ridging at an angle to the prevailing wind and establishing a permanent cover of vegetation also help to control soil blowing.

Water erosion is a major problem on about 45 percent of the cropland and pasture in Warren County. It is a hazard if the slope is more than about 2 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. In spots in some sloping fields, preparing a good seedbed and tilling are difficult because the original friable surface soil has been eroded away. These eroded spots are in areas of Miami and Morley soils. Most of the fertilizer applied to the soil is highly water soluble. The fertilizer that remains in the plow layer is removed along with the soil particles during the erosion process. Second, water erosion results in the sedimentation of streams. Controlling erosion prevents the clogging of drainage ditches and the pollution of streams by sediment and pesticides and improves the quality of water for municipal and recreational uses and for fish and wildlife.

Some erosion-control practices provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. For example, a cropping system that keeps a vegetative cover or crop residue on the soil for extended periods can reduce soil loss to an amount that will not reduce the productive capacity of the soil. In sloping areas on livestock farms, which require pasture and hay, including forage crops of grasses and legumes in the cropping system helps to control erosion, adds nitrogen to the soil, and improves tilth for the following crop.

In many sloping areas of Warren County, a cropping system that provides a substantial vegetative cover is needed. Contour farming and terracing are suitable on most of the sloping soils in the county. They are less successful, however, on eroded soils and on soils that have a clayey surface layer. No-till farming can help to control erosion in areas used for corn or soybeans. The acreage of soybeans double cropped in wheat stubble is increasing in the county. No-till farming and double cropping are effective in controlling erosion in sloping areas. They can be adapted to many of the soils in the county.

Diversions and parallel tile outlet terraces are used to shorten the effective length of slopes and are effective in controlling sheet, rill, and gully erosion. They are most practical on deep, well drained and moderately well drained soils that are susceptible to erosion. These include Barce, Miami, Morley, Rainsville, and Williamstown soils. Terracing reduces soil loss and the associated loss of fertilizer elements and minimizes the sedimentation of cropland and watercourses. It also makes contour farming easier and reduces the need for grassed waterways, which take land out of row crop production.

Because the county has numerous open ditches, many grade stabilization structures are needed. These structures help to control erosion in areas where surface water drains into an open ditch. They are generally needed in open ditches where erosion is a problem on the sides and bottom of some channels because of too much grade and rapidly moving water. On soils that formed in outwash, such as Brenton and La Hogue soils, the banks of open ditches are generally not stable. The banks are subject to sloughing, and the ditches tend to fill up within a few years, reducing their capacity to remove excess water. Subsurface drains entering the ditches also become clogged. Establishing and maintaining sod can control erosion on the ditchbanks.

Soil fertility is naturally high in the northeastern and western parts of the county. The soils on uplands and terraces, such as Billett, Corwin, Markham, Oshtemo, Proctor, and Waupecan soils, are generally neutral to strongly acid. Many soils on wooded uplands and terraces within a few miles of the Wabash River have slopes of 2 to 25 percent. These soils are naturally lower in fertility than other soils in the county. They include Miami, Morley, Rainsville, Rockfield, and Rush soils, which are moderately or severely eroded because of excessive row cropping.

Dark soils on flood plains, including Armiesburg Variant, Comfrey, and Du Page soils, are neutral to moderately alkaline and are naturally higher in content of plant nutrients than light colored soils on flood plains and most soils on uplands. The very poorly drained and poorly drained upland soils, such as Drummer and Ragsdale soils, are in depressional areas and on broad flats. They are generally neutral to medium acid and are high in content of plant nutrients. The mucky Houghton soils are mildly alkaline to medium acid and are high in content of most plant nutrients.

Most of the soils in the county require applications of lime or fertilizer. On all soils, these applications should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to be applied.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous and have a sufficient content of organic matter.

Many soils that are used for crops have a surface layer of silt loam and are low in organic matter content. Generally, they have moderate or weak structure. A crust forms on part of the surface of these soils after intensive rainfall. In some areas the crust is hard and impervious to water when dry. As a result, the rate of water infiltration is reduced and the runoff rate is increased. Returning crop residue to the soil and regularly adding manure and other organic material improve soil structure and minimize crusting.

Fall tillage or chiseling of soybean stubble is generally not a good practice on sloping soils that have a surface layer of silt loam. If a crust forms in winter and spring, these soils are subject to damaging erosion. Many of these soils are nearly as dense and hard at planting time as they were before fall tillage.

Ridge tillage and no-till farming, with or without cover crops, on suitable soils can improve planting conditions. Soil texture, the amount of crop residue on the surface, internal drainage, and surface compaction should be considered before implementation of these systems.

Poor tilth is a problem in Cyclone, Drummer, Sable, and other poorly drained and very poorly drained soils that have a high content of clay in the surface layer. These soils often stay wet until late in spring. If tilled when wet, they tend to be very cloddy when dry. As a result, preparing a good seedbed is difficult.

Grasses and legumes for hay or pasture are not grown extensively on many soils in the county. A permanent cover of grasses and legumes helps to slow runoff and control water erosion and soil blowing.

Many coarse textured soils and soils that have a low available water capacity are well suited to grasses and legumes for hay or pasture. Water erosion, runoff, and soil blowing are the main hazards on these soils. In summer the soils become droughty because of insufficient moisture.

The best suited grasses on coarse textured or droughty soils are smooth bromegrass, orchardgrass, red fescue, tall fescue, sudangrass, and switchgrass. The least suited grasses are Kentucky bluegrass, field bromegrass, ryegrass, and timothy, which generally cannot tolerate droughty conditions. The best suited legumes on these soils are sweet clover, alfalfa, crownvetch, and lespedeza. The least suited legumes are crimson clover, ladino clover, red clover, and white clover.

On the coarse textured or droughty soils, a rotation of continuous small grain or of small grain and grasses and legumes can be used in place of permanent pasture. Both of these alternatives provide cash income and help to control soil blowing. Boyer and Ormas soils are best suited to deep-rooted legumes and drought-tolerant grasses. On these soils, irrigation can reduce droughtiness and the hazard of soil blowing and is sometimes needed to obtain high forage yields *(7)*.

The seasonal high water table is a limitation in poorly drained or very poorly drained soils, such as Cyclone, Ragsdale, and Washtenaw soils. These soils are best suited to the grasses and legumes that can tolerate a high water table from late fall to early spring. The best suited grasses on these soils are reed canarygrass and redtop. The least suited grasses are Kentucky bluegrass, field bromegrass, smooth bromegrass, red fescue, orchardgrass, ryegrass, sudangrass, switchgrass, and timothy. No legume species are well suited to these wet soils, but the best suited species are ladino clover, white clover, and birdsfoot trefoil. The least suited legumes are alfalfa, crimson clover, red clover, and sweet clover. Water management practices, such as a subsurface drainage system, are needed if high forage yields are to be obtained. A subsurface drainage system can help to lower the seasonal high water table in these soils *(7)*.

On moderately well drained or well drained soils, such as Barce, Miami, Montmorenci, and Rainsville soils, erosion and runoff are hazards. These soils are suited to most species of grasses and legumes. Generally, the recommended grass species for seeding mixtures are Kentucky bluegrass, field bromegrass, smooth bromegrass, tall fescue, orchardgrass, and timothy. The recommended legume species are alfalfa, red clover, ladino clover, and alsike clover *(7)*.

The seeding mixtures generally recommended for permanent pasture are birdsfoot trefoil and timothy or bluegrass; timothy or tall fescue or orchardgrass, red clover, and ladino clover; reed canarygrass or tall fescue or orchardgrass, ladino clover, and alsike clover; and tall fescue *(7)*. The seeding mixtures generally recommended for hay, hay silage, or rotation grazing are alfalfa and timothy or bromegrass or orchardgrass; alfalfa, red clover, and orchardgrass or bromegrass or timothy; red clover and orchardgrass; alfalfa, bromegrass or orchardgrass or timothy, and ladino clover or red clover; and tall fescue, white clover, red clover, and lespedeza.

Overgrazing and grazing when the soils are too wet are concerns in managing pasture. Overgrazing reduces plant density and hardiness. It also causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, restricted use during wet periods, and timely application of nutrients help to keep the pasture in good condition.

Specialty crops are of commercial importance in Warren County. A small acreage is used for vegetables, including kidney beans and sweet corn. Most of the well drained and moderately well drained soils in the county are suitable for orchards and nursery plants. In low areas, where frosts are frequent and air movement is poor, the soils generally are poorly suited to 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 hazard is the 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, and Gregory P. Hofmeister, district conservationist, 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 in 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 predicted 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 on 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.

Figure 9.—A campsite in an area of Martinsville loam, 2 to 6 percent slopes, eroded.

Recreation

Gregory P. Hofmeister, district conservationist, Soil Conservation Service, helped prepare this section.

All recreational areas in Warren County are the property of individuals, groups, or towns. An ideal location for recreational development, the county is about 15 to 30 minutes from Danville, Illinois, and Lafayette, Indiana. Terre Haute, Indiana, is about 50 minutes to the south. At present, the county provides opportunities for picnicking, fishing, hunting, camping (fig. 9), hiking, biking, canoeing, bird-watching, and golf. It has excellent sites for hunting ring-necked pheasant.

Warren County also has several unique nature areas. Big Pine Creek is a scenic stream for canoeing. Williamsport Falls, approximately 70 feet high, is located in the town of Williamsport. The Pot Holes, a natural stair-step rock formation, is in the gorges of Fall Creek. Kickapoo Falls and Black Rock are also points of interest.

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 sewer lines. 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, wildlife biologist, and Gregory P. Hofmeister, district conservationist, 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, wheat, oats, and soybeans.

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, 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, ragweed, foxtail, crabgrass, dandelion, and dock.

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, black cherry, elm, sycamore, black walnut, blackberry, and ash. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn olive and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattails, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, red fox, badger, white-tailed deer, coyote, groundhog, and woodcock.

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, 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, cranes, shore birds, muskrat, mink, and beaver.

Edge habitat is the transition zone between one primary land use or cover type and another. Edge habitat is not rated in table 11. Nevertheless, it is of prime importance to birds and mammals, from the smallest songbird to Indiana's largest mammal, white-tailed deer. Many animals that inhabit openland or woodland also frequent edge habitat, and the variety of plant species in areas of edge habitat is disproportionately large. Edge habitat is consistently used by more wildlife than is an area of equal size in the center of a large tract of woodland or cropland. An example of edge habitat that is particularly favorable to wildlife is the border between a no-till field of corn and the outer edge of dense woodland. An irregular or deeply indented border, such as one between a wooded area and a meadow, is even more favorable to wildlife.

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 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, 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, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 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, 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, and the available water capacity in the upper 40 inches 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, 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, 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 and bedrock 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, and soil reaction 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 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, a 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 a 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. These soils 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 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 or stones 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 or stones, 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 and for 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, irrigation, 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.

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 and permeability of the aquifer. 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 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, large stones, slope, and the hazard of cutbanks caving. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone and soil reaction.

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 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 affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, 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 classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

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. 10). "Loam," for example, is soil that is

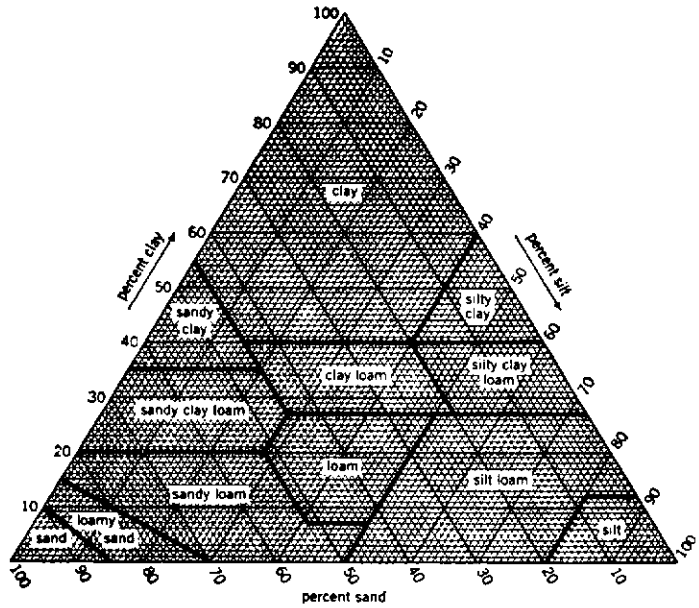

Figure 10.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

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.

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 ⅓ 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. Coarse sands, 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 coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, 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 loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous 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. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

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 in 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 infiltration 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.

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 (fig. 11). 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

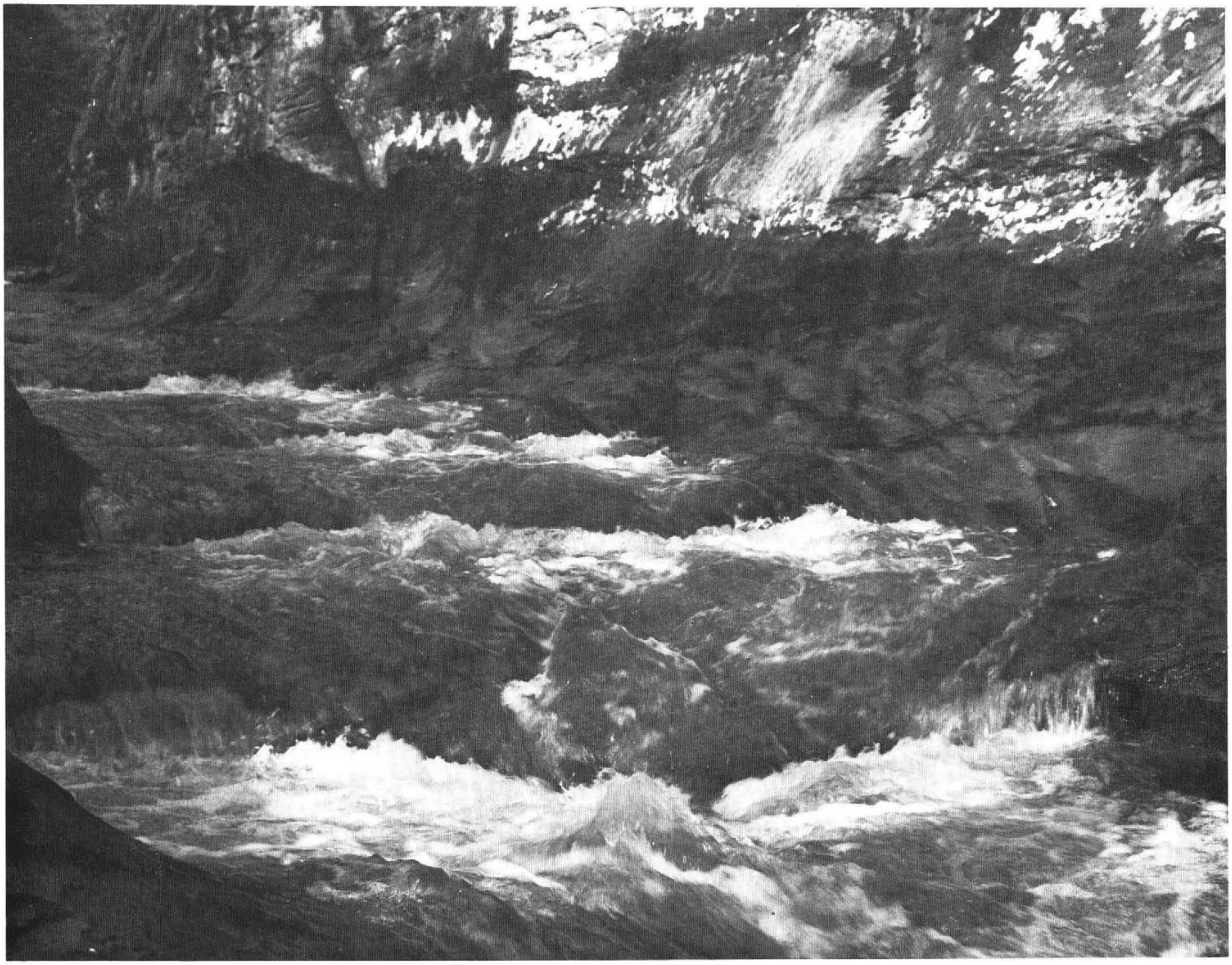

Figure 11.—The bedded sandstone and siltstone underlying the High Gap and Weikert Variant soils show various degrees of resistance to moving water, resulting in a staircase development.

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 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 and acidity.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(9)*. 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. Eleven 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 Mollisol.

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 Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

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 Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquic 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 Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, 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-silty, mixed, mesic Typic Haplaquolls.

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 (8)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (9)*. 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. These soils formed in loess on ridgetops, knolls, and rises on ground moraines. Slopes range from 2 to 6 percent.

Alford soils are similar to Camden and Iona soils and are adjacent to Hennepin and Reesville soils. Camden soils have more sand in the lower part of the subsoil than the Alford soils. Hennepin soils have less silt and more sand in the subsoil than the Alford soils. They are on the steeper slopes. Iona soils have gray mottles in the subsoil. They are in the slightly lower lying areas. Reesville soils are grayer in the subsoil than the Alford soils. They are in nearly level areas on the lower parts of the landscape.

Typical pedon of Alford silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,000 feet east and 1,400 feet north of the southwest corner of sec. 9, T. 20 N., R. 9 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/4) silt loam from the subsoil; weak fine subangular blocky structure parting to weak fine granular; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; many fine and very fine roots; common brown (10YR 4/3) fillings in pores; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—11 to 19 inches; brown (7.5YR 5/4) silty clay loam; moderate fine angular blocky structure; firm; many fine and very fine roots; few brown (10YR 4/3) fillings in pores; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

Bt3—19 to 26 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine and very fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt4—26 to 38 inches; brown (7.5YR 5/4) silt loam; moderate coarse subangular blocky structure; friable; common fine and very fine roots; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; thin discontinuous light yellowish brown (10YR 6/4) silt coatings; strongly acid; gradual wavy boundary.

Bt5—38 to 51 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few fine and very fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; thin patchy light yellowish brown (10YR 6/4) silt coatings; strongly acid; gradual wavy boundary.

2BC1—51 to 57 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few very fine roots; strongly acid; gradual wavy boundary.

2BC2—57 to 66 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; few very fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

2C—66 to 80 inches; light yellowish brown (10YR 6/4) silt; massive; friable; few very fine roots; strong effervescence; moderately alkaline.

The solum is 60 to more than 80 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. The 2C horizon has hue of 10YR and value and chroma 4 to 6.

Armiesburg Variant

The Armiesburg Variant consists of deep, well drained, moderately permeable soils. These soils formed in silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Armiesburg Variant soils are similar to Du Page soils and are adjacent to Beaucoup, Jules, Rodman, and Stonelick soils. Du Page soils have less clay in the solum than the Armiesburg Variant soils. Beaucoup soils are grayer in the subsoil than the Armiesburg Variant soils. They are in depressional areas. Jules and Stonelick soils have less clay in the solum than the Armiesburg Variant soils and have a lighter colored surface layer. They are in the higher lying positions on the landscape. Rodman soils have more sand and gravel than the Armiesburg Variant soils. They are in the steeper areas.

Typical pedon of Armiesburg Variant silty clay loam, frequently flooded, in a cultivated field; 100 feet east and 1,200 feet south of the northwest corner of sec. 32, T. 22 N., R. 7 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine and very fine roots; common light gray (10YR 7/1) shell fragments; slight effervescence; mildly alkaline; abrupt smooth boundary.

A1—10 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry;

weak thin platy structure parting to weak fine subangular blocky; friable; common fine and very fine roots; thin continuous very dark brown (10YR 2/2) organic films on faces of peds; common light gray (10YR 7/1) shell fragments; slight effervescence; moderately alkaline; gradual wavy boundary.

A2—18 to 23 inches; dark brown (10YR 3/3) silty clay loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few very fine roots; thin continuous very dark brown (10YR 2/2) organic films on faces of peds; common light gray (10YR 7/1) shell fragments; slight effervescence; moderately alkaline; gradual wavy boundary.

Bw1—23 to 29 inches; dark brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; few very fine roots; thin discontinuous very dark grayish brown (10YR 3/2) organic films on faces of peds; common white (10YR 8/1) shell fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

Bw2—29 to 38 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) organic films on faces of peds; common white (10YR 8/1) shell fragments; slight effervescence; moderately alkaline; gradual wavy boundary.

Bw3—38 to 48 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) organic films on faces of peds; common white (10YR 8/1) shell fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—48 to 55 inches; dark brown (10YR 4/3) silty clay loam; massive; friable; common white (10YR 8/1) shell fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—55 to 60 inches; dark brown (10YR 4/3) silty clay loam; massive; friable; common white (10YR 8/1) shell fragments; strong effervescence; moderately alkaline.

The solum is 24 to 50 inches thick. The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4.

Barce Series

The Barce series consists of deep, moderately well drained soils. These soils formed in silty sediments, outwash, and glacial till on end moraines and ground moraines. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 12 percent.

Barce soils are similar to Corwin and Symerton soils and are adjacent to Brenton, Gilboa, Montmorenci, and Peotone soils. Corwin and Montmorenci soils have less sand in the upper part of the subsoil than the Barce soils and have a thinner solum, Symerton soils have more clay in the lower part of the subsoil and in the underlying material, and Brenton soils have less sand in the subsoil. Brenton and Gilboa soils are grayer in the subsoil than the Barce soils. They are in the less sloping positions on the landscape. Montmorenci soils are in landscape positions similar to those of the Barce soils. Peotone soils are grayer than the Barce soils and have more clay in the subsoil. They are in depressional areas.

Typical pedon of Barce silt loam, in a cultivated area of Barce-Montmorenci silt loams, 2 to 6 percent slopes, eroded; 900 feet north and 130 feet west of the southeast corner of sec. 12, T. 22 N., R. 9 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; mixed with yellowish brown (10YR 5/4) silty clay loam from the subsoil; moderate fine granular structure; friable; many fine and very fine roots; about 1 percent gravel; medium acid; abrupt smooth boundary.

Bt1—10 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; many fine and very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 1 percent gravel; medium acid; abrupt wavy boundary.

2Bt2—15 to 32 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; common very fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 9 percent gravel; medium acid; clear wavy boundary.

2Bt3—32 to 42 inches; dark brown (7.5YR 4/4) sandy clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; few yellowish red (5YR 5/8) iron accumulations; about 12 percent gravel; slightly acid; abrupt wavy boundary.

3Bt4—42 to 50 inches; yellowish brown (10YR 5/4) loam; common fine distinct yellowish brown (10YR 5/8) and many fine distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common yellowish red (5YR 5/8) iron accumulations; about 4 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

3Cd—50 to 60 inches; light olive brown (2.5Y 5/4) loam; common fine distinct gray (10YR 5/1) and common medium distinct brownish yellow (10YR 6/8) mottles; massive; firm; about 4 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty deposits are less than 20 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is silt loam or loam. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, sandy clay loam, or gravelly sandy clay loam. The content of gravel ranges from 0 to 10 percent in the upper part of the 2Bt horizon and from 10 to 25 percent in the lower part. It ranges from 0 to 10 percent in the 3Bt and 3Cd horizons. The 3Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. The 3Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Beaucoup Series

The Beaucoup series consists of deep, very poorly drained, moderately slowly permeable soils. These soils formed in silty alluvium in slack-water areas on flood plains. Slopes range from 0 to 2 percent.

Beaucoup soils are similar to Comfrey soils and are adjacent to Armiesburg Variant, Gosport, and Piankeshaw Variant soils. Comfrey soils have a surface layer that is thicker than that of the Beaucoup soils and have more sand throughout. Armiesburg Variant, Gosport, and Piankeshaw Variant soils have a subsoil that is browner than that of the Beaucoup soils. Also, Piankeshaw Variant soils have more sand and gravel. Armiesburg Variant and Piankeshaw Variant soils are in the higher lying positions on the landscape. Gosport soils are underlain by bedrock. They are on steep breaks.

Typical pedon of Beaucoup silty clay loam, frequently flooded, undrained, in a wooded area; 820 feet west and 1,120 feet south of the northeast corner of sec. 31, T. 22 N., R. 7 W.

A1—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; many fine and medium roots; neutral; clear wavy boundary.

A2—10 to 15 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; many fine and medium roots; neutral; clear wavy boundary.

Bg1—15 to 22 inches; dark gray (10YR 4/1) silty clay loam; many fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to weak fine subangular blocky; firm; many fine and medium roots; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; many very dark gray (10YR 3/1) krotovinas; slightly acid; clear wavy boundary.

Bg2—22 to 30 inches; gray (10YR 5/1) silty clay loam; common fine distinct strong brown (7.5YR 4/6) and common medium distinct grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; common fine and very fine roots; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; many very dark gray (10YR 3/1) krotovinas; slightly acid; clear wavy boundary.

Bg3—30 to 40 inches; gray (N 5/0) silty clay loam; common medium distinct strong brown (7.5YR 5/6) and many medium faint grayish brown (2.5Y 5/2) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; common fine and very fine roots; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; slightly acid; gradual wavy boundary.

BCg—40 to 49 inches; gray (5Y 5/1) silty clay loam that has thin strata of silt loam; many medium distinct grayish brown (2.5Y 5/2) and common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; common fine and very fine roots; common very dark gray (10YR 3/1) krotovinas; neutral; gradual wavy boundary.

Cg—49 to 60 inches; olive gray (5Y 5/2) silt loam that has thin strata of loam; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) mottles; massive; firm; common fine and very fine roots; few very dark gray (10YR 3/1) krotovinas; neutral.

The solum is 40 to 60 inches thick. The mollic epipedon is 10 to 24 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bg and BCg horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2, or they are neutral in hue and have value of 4 to 6. The Cg horizon has colors similar to those of the Bg and BCg horizons. It is silty clay loam or silt loam and has thin strata of coarser textured material.

Beckville Series

The Beckville series consists of deep, moderately well drained, moderately rapidly permeable soils. These soils formed in loamy alluvium on flood plains. Slopes range from 0 to 2 percent.

Beckville soils are adjacent to Morley, Stonelick, and Wakeland Variant soils. Morley and Stonelick soils are browner in the subsoil than the Beckville soils. Also, Morley soils have more clay. They are in the higher upland areas. Stonelick soils are on the slightly higher rises. Wakeland Variant soils have more silt than the Beckville soils. They are in the lower lying positions on the landscape.

Typical pedon of Beckville loam, occasionally flooded, in a wooded area; 800 feet west and 600 feet south of the northeast corner of sec. 10, T. 22 N., R. 8 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many very fine and fine roots; about 1 percent gravel; neutral; clear wavy boundary.

Bw1—5 to 15 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; many very fine and fine roots; thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bw2—15 to 31 inches; brown (10YR 4/3) sandy loam; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; very friable; thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; about 2 percent gravel; neutral; gradual wavy boundary.

C—31 to 42 inches; brown (10YR 5/3) sandy loam; many fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; about 2 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg—42 to 60 inches; dark grayish brown (10YR 4/2) sandy loam; common fine distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/4) mottles; about 2 percent gravel; strong effervescence; mildly alkaline.

The solum is 20 to 40 inches thick. It is neutral or mildly alkaline. Free carbonates are at a depth of 20 to 40 inches. The A horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It is loam or silt loam. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma 3 to 6. It is loam, sandy loam, or fine sandy loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is sandy loam or loam. It is mildly alkaline or moderately alkaline.

Billett Series

The Billett series consists of deep, moderately well drained and well drained soils. These soils formed in outwash sediments on ground moraines. Permeability is moderately rapid in the solum and rapid in the underlying material. Slopes range from 1 to 12 percent.

Billett soils are similar to Carmi, Elston, and Glenhall soils and are adjacent to La Hogue soils. Carmi soils have more gravel in the solum than the Billett soils and have a thicker surface layer. Elston soils also have a thicker solum. Glenhall and La Hogue soils have more clay in the subsoil than the Billett soils. Also, La Hogue soils have a grayer subsoil. They are in the lower lying positions on the landscape.

Typical pedon of Billett sandy loam, 1 to 4 percent slopes, eroded, in a cultivated field; 520 feet east and 1,480 feet south of the northwest corner of sec. 11, T. 23 N., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; mixed with dark yellowish brown (10YR 4/4) sandy loam from the subsoil; weak medium granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 12 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; friable; many very fine roots; thin continuous dark brown (10YR 3/3) organic clay coatings on faces of peds and within pores; medium acid; clear wavy boundary.

Bt2—12 to 25 inches; yellowish brown (10YR 5/4) sandy loam; weak fine subangular blocky structure; friable; common very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds and clay bridges between sand grains; about 1 percent gravel; strongly acid; clear wavy boundary.

Bt3—25 to 37 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few very fine roots; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds and clay bridges between sand grains; about 2 percent gravel; strongly acid; gradual wavy boundary.

BCt—37 to 45 inches; brown (7.5YR 5/4) loamy sand; few fine distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very friable; thin patchy dark brown (7.5YR 4/4) clay bridges between sand grains; about 2 percent gravel; medium acid; gradual wavy boundary.

C1—45 to 51 inches; dark yellowish brown (10YR 4/4) sand that has thin lenses of brown (7.5YR 4/4) loamy fine sand; few fine distinct light brownish gray (10YR 6/2) and common fine distinct strong brown (7.5YR 5/8) mottles; single grain sand and massive loamy fine sand; loose sand and very friable loamy fine sand; about 2 percent gravel; slightly acid; clear wavy boundary.

C2—51 to 60 inches; yellowish brown (10YR 5/4) sand that has thin lenses of brown (7.5YR 4/4) loamy sand; common medium distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; single grain sand and massive loamy sand; loose sand and very friable loamy sand; about 2 percent gravel; neutral.

The solum is 30 to 50 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is sandy loam or fine sandy loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is dominantly sandy loam or fine sandy loam, but in some pedons it has thin subhorizons of loam or sandy clay loam. The BCt horizon has colors similar to those of the Bt horizon. It is loamy sand, loamy fine sand, sandy loam, or fine sandy loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is loamy sand, sand, loamy fine sand, or fine sand.

Blount Series

The Blount series consists of deep, somewhat poorly drained, moderately slowly permeable soils. These soils formed in silty sediments and glacial till on ground moraines and end moraines. Slopes range from 0 to 2 percent.

Blount soils are similar to Elliott and Ipava soils and are adjacent to Cadiz and Morley soils. Elliott and Ipava soils have a surface layer that is thicker and darker than that of the Blount soils. Cadiz and Morley soils are in the higher lying areas. Their subsoil is browner than that of the Blount soils. Also, the subsoil of the Cadiz soils has less clay.

Typical pedon of Blount silt loam, 0 to 2 percent slopes, in a cultivated field; 2,500 feet west and 2,500 feet north of the southeast corner of sec. 33, T. 21 N., R. 9 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; medium acid; abrupt smooth boundary.

BE—8 to 11 inches; light brownish gray (10YR 6/2) silt loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; friable; few dark reddish brown (5YR 3/2) accumulations of iron and manganese oxide; common fine roots; strongly acid; clear wavy boundary.

2Bt1—11 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4), few fine distinct strong brown (7.5YR 5/8), and many fine distinct light brownish gray (10YR 6/2) mottles; moderate fine angular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few dark reddish brown (5YR 3/2) accumulations of iron and manganese oxide; few very fine roots; very strongly acid; clear wavy boundary.

2Bt2—16 to 24 inches; yellowish brown (10YR 5/4) silty clay; many medium distinct grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; medium continuous grayish brown (10YR 5/2) clay films on faces of peds; few dark reddish brown (5YR 3/2) accumulations of iron and manganese oxide; few very fine roots; very strongly acid; clear wavy boundary.

2Bt3—24 to 32 inches; light olive brown (2.5Y 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/8) and many medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; medium continuous dark gray (10YR 4/1) clay films on faces of peds; many black (10YR 2/1) accumulations of iron and manganese oxide; about 1 percent gravel; few very fine roots; neutral; clear wavy boundary.

2Bt4—32 to 36 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/8) and many fine distinct light brownish gray (2.5Y 6/2) mottles; weak coarse subangular blocky structure; firm; medium discontinuous dark gray (10YR 4/1) clay films on faces of peds; few black (10YR 2/1) accumulations of iron and manganese oxide; about 1 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2BCt—36 to 41 inches; light yellowish brown (2.5Y 6/4) silt loam; common medium distinct gray (5Y 6/1), yellowish brown (10YR 5/6), and brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; firm; thin patchy dark brown (7.5YR 4/2) clay films on faces of peds and filling voids; few very pale brown (10YR 8/3) accumulations of carbonate; about 2 percent gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

2Cd—41 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam; common medium distinct gray (5Y 6/1), yellowish brown (10YR 5/6), and brownish yellow (10YR 6/6) mottles; massive; very firm; common very pale brown (10YR 8/3) accumulations of carbonate; about 4 percent gravel; strong effervescence; moderately alkaline.

The solum is 22 to 45 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The 2Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is clay loam, silty clay, or silty clay loam. The 2Cd horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is silt loam or silty clay loam in which the content of clay is more than 22 percent.

Boyer Series

The Boyer series consists of deep, well drained soils. These soils formed in loamy and gravelly outwash on terraces. Permeability is moderately rapid in the solum and very rapid in the underlying material. Slopes range from 8 to 20 percent.

Boyer soils are adjacent to Eldean, Mudlavia, Ormas, Oshtemo, and Rodman soils. Eldean and Mudlavia soils have more clay in the subsoil than the Boyer soils. Also, Mudlavia soils have more rock fragments. They are on the upper part of side slopes. Eldean soils are on the less sloping flats. Ormas soils have less clay in the upper part of the solum than the Boyer soils. They are on the lower lying terraces. Oshtemo soils have a solum that is thicker than that of the Boyer soils. They are on the less sloping flats.

Typical pedon of Boyer gravelly sandy loam, in a cultivated area of Boyer-Mudlavia complex, 8 to 20 percent slopes, eroded; 2,200 feet east and 2,300 feet south of the northwest corner of sec. 31, T. 21 N., R. 8 W.

Ap—0 to 8 inches; brown (10YR 4/3) gravelly sandy loam, light gray (10YR 7/2) dry; mixed with yellowish brown (10YR 5/6) gravelly sandy loam from the subsoil; weak medium granular structure; very friable; many very fine and fine roots; about 20 percent gravel; about 5 percent cobblestones; medium acid; abrupt smooth boundary.

Bt1—8 to 20 inches; yellowish brown (10YR 5/6) gravelly sandy loam; weak fine subangular blocky structure; very friable; common very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds and clay bridges between sand grains; about 25 percent gravel; about 4 percent cobblestones; medium acid; clear wavy boundary.

Bt2—20 to 29 inches; strong brown (7.5YR 5/6) gravelly sandy loam; weak medium subangular blocky structure; very friable; few very fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds and clay bridges between sand grains; about 25 percent gravel; about 4 percent cobblestones; slightly acid; clear wavy boundary.

Bt3—29 to 35 inches; brown (7.5YR 4/4) gravelly sandy clay loam; weak coarse subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; about 25 percent gravel; about 5 percent cobblestones; neutral; clear irregular boundary.

C—35 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; about 30 percent gravel; about 10 percent cobblestones; slight effervescence; mildly alkaline.

The solum is 20 to 40 inches thick. The content of coarse fragments ranges from 15 to 30 percent in the solum and from 15 to 50 percent in the underlying material. 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 to 6, and chroma of 3 to 6. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4.

Brenton Series

The Brenton series consists of deep, somewhat poorly drained soils. These soils formed in silty sediments and loamy outwash on ground moraines and end moraines. Permeability generally is moderate. In the till substratum and moderately fine substratum phases, however, it is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 0 to 2 percent.

Brenton soils are similar to Gilboa, Lafayette, and La Hogue soils and are adjacent to Barce, Drummer, Glenhall, Montmorenci, and Proctor soils. Gilboa and La Hogue soils have more sand in the subsoil than the Brenton soils, and Lafayette soils have more gravel in the lower part of the subsoil and in the underlying material. Drummer soils are grayer in the subsoil than the Brenton soils. They are in the lower lying depressions. Barce, Glenhall, Montmorenci, and Proctor soils are browner in the subsoil than the Brenton soils. Also, Barce, Glenhall, and Montmorenci soils have more sand in the subsoil. All of the adjacent soils are in the more sloping positions on the landscape.

Typical pedon of Brenton silt loam, 0 to 2 percent slopes, in a cultivated field; 1,500 feet east and 150 feet north of the southwest corner of sec. 18, T. 22 N., R. 9 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many very fine roots; neutral; abrupt smooth boundary.

A—8 to 14 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; many very fine roots; medium acid; clear wavy boundary.

Btg—14 to 22 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common very fine roots; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; many very dark gray (10YR 3/1) organic stains on faces of peds; medium acid; clear wavy boundary.

Bt1—22 to 28 inches; brown (10YR 4/3) silty clay loam; common fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few very dark gray (10YR 3/1) organic stains on faces of peds; medium acid; clear wavy boundary.

2Bt2—28 to 45 inches; dark yellowish brown (10YR 4/4) loam; many fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 2 percent gravel; slightly acid; clear wavy boundary.

2Bt3—45 to 52 inches; brown (10YR 5/3) loam; many fine faint grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 4 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

2Cg—52 to 60 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; thin strata of loamy sand and fine sandy loam; about 4 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty deposits are 24 to 40 inches thick. The depth to carbonates is more than 40 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Btg and Bt horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is clay loam, loam, silty clay loam, silt loam, fine sandy loam, or sandy loam. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 to 8. It is silt loam, loam, sandy loam, or fine sandy loam and has strata of sand. Till substratum and moderately fine substratum phases of this series are mapped in the county.

Cadiz Series

The Cadiz series consists of deep, moderately well drained soils. These soils formed in silty sediments and glacial till on end moraines. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 1 to 12 percent.

Cadiz soils are similar to Iona and Morley soils and are adjacent to Blount and Hennepin soils. Iona soils have gray mottles in the upper part of the subsoil. Blount and Morley soils have more clay in the subsoil than the Cadiz soils. Also, Blount soils have a grayer subsoil. They are in the less sloping positions on the landscape. Hennepin soils have less silt and more sand in the subsoil than the Cadiz soils. They are on the steeper breaks.

Typical pedon of Cadiz silt loam, moderately wet, 1 to 6 percent slopes, eroded, in a cultivated field; 300 feet west and 300 feet north of the southeast corner of sec. 12, T. 21 N., R. 9 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; mixed with yellowish brown (10YR 5/4) material from the subsoil; weak fine granular structure; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine and very fine roots; few brown (10YR 5/3) worm channels; medium acid; clear wavy boundary.

Bt2—16 to 29 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 4/4) clay films on faces of peds; few very fine roots; slightly acid; abrupt wavy boundary.

2Bt3—29 to 36 inches; light olive brown (2.5Y 5/6) silty clay loam; common fine distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

2BCt—36 to 44 inches; light olive brown (2.5Y 5/4) silt loam; common fine distinct light brownish gray (2.5Y 6/2) mottles; weak coarse subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; few black (10YR 2/1) accumulations of iron and manganese oxide; about 2 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

2Cd—44 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; very firm; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 30 to 55 inches thick. The thickness of the silt cap ranges from 24 to 40 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 or 2.5Y, value of 4 or 5, and chroma of 3 to 6. The 2BCt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The 2Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. It is silty clay loam or silt loam in which the content of clay is more than 22 percent.

Camden Series

The Camden series consists of deep, well drained and moderately well drained soils. These soils formed in silty sediments and loamy outwash on terraces. Permeability generally is moderate in the solum and moderate or moderately rapid in the underlying material. In the till substratum phase, however, it is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 0 to 6 percent.

Camden soils are similar to Alford, Martinsville, and Rush soils and are adjacent to Millbrook and Starks soils. Alford soils have less sand in the lower part of the subsoil than the Camden soils, Martinsville soils have more sand in the solum, and Rush soils have more gravel in the lower part of the subsoil and in the underlying material. Millbrook and Starks soils are grayer in the subsoil than the Camden soils. They are in the lower positions on the landscape.

Typical pedon of Camden silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 100 feet west and 1,200 feet south of the northeast corner of sec. 31, T. 23 N., R. 6 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/4) silty clay loam from the subsoil; moderate medium granular structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.

Bt1—7 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; few very fine roots; strongly acid; clear wavy boundary.

Bt2—24 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; abrupt irregular boundary.

2Bt3—38 to 49 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent gravel; medium acid; clear wavy boundary.

2Bt4—49 to 53 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; about 3 percent gravel; medium acid; clear wavy boundary.

2C—53 to 60 inches; yellowish brown (10YR 5/6) sandy loam that has thin strata of sand and loamy sand; massive; very friable; about 3 percent gravel; slightly acid.

The thickness of the solum ranges from 45 to 65 inches. The thickness of the silty material ranges from

24 to 40 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 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam, loam, sandy clay loam, or sandy loam. The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is sandy loam that has thin strata of sand, loamy sand, loamy coarse sand, or loam. A till substratum phase of this series is mapped in the county.

Carmi Series

The Carmi series consists of deep, well drained soils. These soils formed in outwash deposits on terraces. Permeability is moderately rapid in the upper part of the subsoil and rapid in the lower part and in the underlying material. Slopes range from 0 to 2 percent.

Carmi soils are similar to Billett, Elston, and Oshtemo soils. Billett and Elston soils have less gravel in the solum than the Carmi soils. Also, Billett soils have a thinner surface layer. Oshtemo soils have a surface layer that is lighter colored than that of the Carmi soils.

Typical pedon of Carmi loam, 0 to 2 percent slopes, in a cultivated field; 150 feet east and 400 feet south of the northwest corner of sec. 34, T. 20 N., R. 9 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; many very fine roots; neutral; abrupt smooth boundary.

A—9 to 16 inches; very dark brown (10YR 2/2) loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; common very fine roots; about 11 percent gravel; slightly acid; clear wavy boundary.

Bt1—16 to 25 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; about 27 percent gravel; medium acid; clear wavy boundary.

Bt2—25 to 33 inches; dark brown (7.5YR 3/4) gravelly loamy coarse sand; weak coarse subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 3/4) clay bridges between sand grains; about 34 percent gravel; medium acid; gradual wavy boundary.

BCt—33 to 45 inches; dark brown (7.5YR 3/4) gravelly loamy coarse sand; weak coarse subangular blocky structure; very friable; thin dark brown (7.5YR 3/4) clay bridges between sand grains; about 34 percent gravel; slightly acid; abrupt irregular boundary.

C—45 to 60 inches; brown (10YR 5/3) very gravelly coarse sand; single grain; loose; about 36 percent gravel; strong effervescence; mildly alkaline.

The solum is 40 to 80 inches thick. The content of gravel ranges from 15 to 35 percent in the Bt horizon and from 15 to 60 percent in the C horizon. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. It is gravelly loam, gravelly sandy clay loam, gravelly sandy loam, or gravelly coarse sandy loam in the upper part and gravelly loamy sand or gravelly loamy coarse sand in the lower part. The C horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 3 or 4. It is gravelly sand, gravelly loamy sand, gravelly coarse sand, gravelly loamy coarse sand, or the very gravelly analogs of those textures.

Chatterton Series

The Chatterton series consists of deep, well drained, rapidly permeable soils. These soils formed in sandy alluvium on flood plains. Slopes range from 0 to 2 percent.

Chatterton soils are similar to Moundhaven soils and are adjacent to Landes, Ormas, Oshtemo, and Stonelick soils. Moundhaven soils have a surface layer that is lighter colored than that of the Chatterton soils. Landes soils have more clay in the solum than the Chatterton soils. They are in the slightly lower lying areas. Ormas and Oshtemo soils have more gravel than the Chatterton soils. They are on nearby terraces. Stonelick soils have more clay in the solum than the Chatterton soils and have a lighter colored surface layer. They are in the slightly higher lying areas on flood plains.

Typical pedon of Chatterton loamy sand, in a cultivated area of Landes-Chatterton complex, frequently flooded; 1,660 feet west and 430 feet north of the center of sec. 23, T. 21 N., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; common very fine roots; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak medium granular; very friable; few very fine roots; neutral; clear wavy boundary.

Bw1—12 to 18 inches; dark brown (10YR 4/3) loamy sand; weak medium subangular blocky structure parting to weak fine granular; very friable; thin continuous dark brown (10YR 3/3) organic coatings on faces of peds; common very dark grayish brown (10YR 3/2) root and worm channels; neutral; clear wavy boundary.

Bw2—18 to 24 inches; dark brown (10YR 4/3) loamy sand; weak medium subangular blocky structure parting to weak fine granular; very friable; thin strata of very dark grayish brown (10YR 3/2) sandy loam and silt loam; thin discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; common very dark grayish brown (10YR 3/2) fillings in root and worm channels; mildly alkaline; clear wavy boundary.

Bw3—24 to 32 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure parting to weak fine granular; very friable; thin dark brown (10YR 3/3) organic coatings on sand grains; few very dark grayish brown (10YR 3/2) fillings in root and worm channels; slight effervescence; moderately alkaline; gradual wavy boundary.

C1—32 to 44 inches; brown (10YR 5/3) sand; single grain; loose; thin strata of dark brown (10YR 4/3) sandy loam and loam; about 2 percent gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—44 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; thin strata of dark brown (10YR 4/3) sandy loam and loam; about 3 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The depth to free carbonates also ranges from 20 to 40 inches. The content of gravel ranges from 0 to 3 percent in the A and Bw horizons and from 0 to 5 percent in the C horizon. The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

Comfrey Series

The Comfrey series consists of deep, very poorly drained, moderately permeable soils. These soils formed in loamy alluvium on flood plains. Slopes range from 0 to 2 percent.

Comfrey soils are similar to Beaucoup soils and are adjacent to Lafayette, Rodman, and Waupecan soils. Beaucoup soils have less sand throughout than the Comfrey soils and have a thinner surface layer. Lafayette, Rodman, and Waupecan soils are browner in the subsoil than the Comfrey soils. Lafayette and Waupecan soils are in the higher lying areas. Rodman soils have a solum that is thinner than that of the Comfrey soils. They are on steep breaks.

Typical pedon of Comfrey loam, stratified substratum, frequently flooded, undrained, in a pasture; 2,530 feet west and 250 feet south of the northeast corner of sec. 4, T. 23 N., R. 7 W.

A1—0 to 9 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; many very fine roots; neutral; clear wavy boundary.

A2—9 to 15 inches; black (N 2/0) loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; many very fine roots; neutral; gradual wavy boundary.

A3—15 to 30 inches; black (N 2/0) loam, dark gray (10YR 4/1) dry; few fine distinct olive (5Y 5/3) mottles; moderate coarse granular structure; friable; common very fine roots; thin discontinuous dark olive gray (5Y 3/2) organic coatings on faces of peds; about 4 percent gravel; neutral; gradual wavy boundary.

Bg1—30 to 36 inches; dark gray (5Y 4/1) clay loam; many fine distinct light olive brown (2.5Y 5/4) mottles; weak fine subangular blocky structure; firm; common very fine roots; thin discontinuous black (5Y 2.5/1) organic coatings on faces of peds; about 5 percent gravel; neutral; gradual wavy boundary.

Bg2—36 to 42 inches; gray (10YR 5/1) sandy clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few very fine roots; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; about 5 percent gravel; neutral; gradual wavy boundary.

Bg3—42 to 45 inches; gray (10YR 6/1) sandy clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; about 5 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg—45 to 60 inches; gray (10YR 5/1) silt loam that has thin strata of loamy sand and fine sandy loam; many fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; about 5 percent gravel; slight effervescence; mildly alkaline.

The solum is 40 to 55 inches thick. The mollic epipedon is 24 to 36 inches thick. The content of gravel ranges from 0 to 5 percent in the A horizon and from 0 to 10 percent in the Bg and Cg horizons. The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue. It is loam or silt loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is loam, clay loam, or sandy clay loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is loam, silt loam, or clay loam that has strata of coarser textured material.

Corwin Series

The Corwin series consists of deep, moderately well drained soils. These soils formed in silty sediments and glacial till on moraines. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 6 percent.

Corwin soils are similar to Barce, Montmorenci, and Varna soils and are adjacent to Gilboa soils. Barce soils have more sand in the upper part of the subsoil than the Corwin soils and have a thicker solum, Montmorenci soils have a thinner surface layer, and Varna soils have more clay in the subsoil and in the underlying material. Gilboa soils have a subsoil that is grayer than that of the Corwin soils. They are in the slightly lower positions on the landscape.

Typical pedon of Corwin silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,200 feet east and 1,600 feet north of the southwest corner of sec. 2, T. 22 N., R. 9 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with dark yellowish brown (10YR 4/4) silty clay loam from the subsoil; weak fine granular structure; friable; few medium and many fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—10 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; few medium and many fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 1 percent gravel; slightly acid; clear wavy boundary.

2Bt2—17 to 25 inches; dark yellowish brown (10YR 4/4) clay loam; few fine faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; about 2 percent gravel; slightly acid; clear wavy boundary.

2Bt3—25 to 31 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

2Bt4—31 to 38 inches; brown (10YR 4/3) loam; few fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; neutral; gradual wavy boundary.

2Cd—38 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; about 4 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 24 to 40 inches. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is silt loam or loam. The Bt horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 6. The Cd horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

Cyclone Series

The Cyclone series consists of deep, poorly drained soils. These soils formed in silty sediments and glacial drift on end moraines. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 0 to 2 percent.

Cyclone soils are similar to Sable soils and are adjacent to Rainsville, Rockfield, Starks, Tuscola, and Williamstown soils. Sable soils have less sand in the lower part of the subsoil and in the underlying material than the Cyclone soils. Rainsville, Rockfield, Starks, Tuscola, and Williamstown soils are in the higher, more sloping positions on the landscape. They are browner in the subsoil than the Cyclone soils. Also, Rainsville, Tuscola, and Williamstown soils have more sand in the solum.

Typical pedon of Cyclone silty clay loam, in a cultivated field; 2,150 feet west and 1,200 feet south of the northeast corner of sec. 8, T. 22 N., R. 7 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many very fine roots; neutral; abrupt smooth boundary.

A—10 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; many very fine roots; neutral; clear wavy boundary.

Btg1—14 to 28 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; thin continuous dark gray (5Y 4/1) clay films on faces of peds; neutral; gradual wavy boundary.

Btg2—28 to 48 inches; dark gray (10YR 4/1) silty clay loam; many fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine roots; thin continuous dark gray (5Y 4/1) clay films on faces of peds; neutral; clear wavy boundary.

2Bt—48 to 55 inches; yellowish brown (10YR 5/4) loam; many fine distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; thin patchy dark gray (5Y 4/1) clay films on faces of peds; about 3 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2Cd—55 to 60 inches; yellowish brown (10YR 5/4) loam; many fine distinct gray (10YR 5/1) mottles; massive; firm; about 3 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 50 to 75 inches. The thickness of the silty material ranges from 40 to 60 inches. 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, value of 3 to 5, and chroma of 1 or 2. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The 2Cd horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

Drummer Series

The Drummer series consists of deep, poorly drained soils. These soils formed in silty sediments and outwash deposits on ground moraines and end moraines. Permeability generally is moderate. In the stratified sandy substratum phase, however, it is moderate in the solum and moderate or moderately rapid in the underlying material, and in the gravelly substratum phase, it is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 2 percent.

Drummer soils are similar to Ragsdale and Sable soils and are adjacent to Brenton, Elliott, Markham, Proctor, and Williamsport soils. Ragsdale and Sable soils have less sand in the lower part of the subsoil and in the underlying material than the Drummer soils. Brenton, Elliott, Markham, Proctor, and Williamsport soils are in the higher lying positions on the landscape. They are browner in the subsoil than the Drummer soils. Also, Elliott, Markham, and Williamsport soils have more clay in the subsoil.

Typical pedon of Drummer silty clay loam, in a cultivated area of Drummer silty clay loams; 1,300 feet east and 1,350 feet north of the center of sec. 20, T. 21 N., R. 9 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

A—9 to 14 inches; black (5Y 2.5/1) silty clay loam, dark gray (5Y 4/1) dry; weak medium subangular blocky structure; firm; many fine and very fine roots; slightly acid; clear wavy boundary.

Bg1—14 to 22 inches; dark gray (5Y 4/1) silty clay loam; few fine distinct light yellowish brown (2.5Y 6/4) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; thick continuous black (5Y 2.5/1) organic coatings on faces of peds; common black (5Y 2.5/1) krotovinas; neutral; clear wavy boundary.

Bg2—22 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/8) and common fine distinct light yellowish brown (2.5Y 6/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine roots; thin discontinuous very dark gray (5Y 3/1) organic coatings on faces of peds; common very dark gray (5Y 3/1) krotovinas; neutral; gradual wavy boundary.

Bg3—31 to 41 inches; light olive gray (5Y 6/2) silty clay loam; few fine distinct yellowish brown (10YR 5/8) and common fine distinct olive yellow (2.5Y 6/6) mottles; weak medium subangular blocky structure; firm; few very dark gray (10YR 3/1) krotovinas; neutral; gradual wavy boundary.

2BCg—41 to 50 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct yellowish brown (10YR 5/8) and many medium distinct olive yellow (2.5Y 6/8) mottles; weak coarse subangular blocky structure; friable; few very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

2Cg—50 to 60 inches; light brownish gray (2.5Y 6/2) loam; few fine distinct yellowish brown (10YR 5/8) and common fine distinct olive yellow (2.5Y 6/8) mottles; massive; friable; few very dark gray (10YR 3/l) krotovinas; light brownish gray (2.5Y 6/2) lenses of sandy loam; slight effervescence; mildly alkaline.

The solum is 42 to 65 inches thick. The silty material is 40 to 60 inches thick. The A horizon has hue of l0YR, 2.5Y, or 5Y, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue. The Bg horizon has hue of 10YR, 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam or silty clay loam. The 2BCg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. It is dominantly silt loam or loam, but in some pedons it has thin strata of silty clay loam, sandy loam, or fine sandy loam. The 2Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. It is loam or silt loam and has strata of silty clay loam or sandy loam. Stratified sandy substratum and gravelly substratum phases of this series are mapped in the county.

Du Page Series

The Du Page series consists of deep, well drained, moderately permeable soils. These soils formed in alluvium on flood plains. Slopes range from 0 to 2 percent.

Du Page soils are similar to Armiesburg Variant soils and are adjacent to Moundhaven, Ormas, and Stonelick soils. Armiesburg Variant soils have more clay in the solum than the Du Page soils, and Moundhaven, Ormas, and Stonelick soils have a lighter colored surface layer. Also, Moundhaven and Stonelick soils have less clay. They are in the slightly higher lying areas on the flood plains. Ormas soils have less clay in the upper part of the solum than the Du Page soils. They are on nearby terraces.

Typical pedon of Du Page loam, frequently flooded, in a cultivated field; 900 feet east and 450 feet north of the southwest corner of sec. 17, T. 22 N., R. 6 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many very fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

A—10 to 26 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; many very fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

Bw1—26 to 40 inches; dark brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; common very fine roots; common dark brown (10YR 3/3) organic films on faces of peds; many light gray (10YR 7/1) shell fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

Bw2—40 to 50 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; few very fine roots; common dark brown (10YR 3/3) organic films on faces of peds; many light gray (10YR 7/1) shell fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C—50 to 60 inches; brown (10YR 4/3) silt loam; massive; friable; few very fine roots; many light gray (10YR 7/1) shell fragments; strong effervescence; moderately alkaline.

The solum is 24 to 50 inches thick. The mollic epipedon is 24 to 34 inches thick. The entire profile is silt loam or loam. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The Bw horizon has hue of 10YR, value of 4, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 4, and chroma of 2 to 4.

Eldean Series

The Eldean series consists of deep, well drained soils. These soils formed in glacial outwash on terraces. Permeability is moderate or moderately slow in the solum and very rapid in the underlying material. Slopes range from 0 to 6 percent.

Eldean soils are similar to Mudlavia and Ockley soils and are adjacent to Boyer and Rodman soils. Mudlavia soils have more gravel and cobbles in the solum than the Eldean soils and have a thicker solum. Ockley soils also have a thicker solum and have less clay in the subsoil. Boyer soils have less clay in the subsoil than the Eldean soils. They are on the more sloping terrace breaks. Rodman soils have a solum that is thinner and less clayey than that of the Eldean soils. They are on steep and very steep breaks on terraces.

Typical pedon of Eldean gravelly loam, 2 to 6 percent slopes, eroded, in a cultivated field; 520 feet west and 1,040 feet south of the northeast corner of sec. 36, T. 21 N., R. 9 W.

Ap—0 to 8 inches; brown (10YR 4/3) gravelly loam, pale brown (10YR 6/3) dry; mixed with dark yellowish brown (10YR 4/4) gravelly clay loam from the subsoil; moderate fine granular structure; friable; many very fine and fine roots; about 20 percent gravel; about 3 percent cobblestones; medium acid; abrupt smooth boundary.

Bt1—8 to 16 inches; dark yellowish brown (10YR 4/4) gravelly clay loam; moderate fine subangular blocky structure; friable; common very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; about 25 percent gravel; about 3 percent cobblestones; medium acid; clear wavy boundary.

Bt2—16 to 22 inches; strong brown (7.5YR 4/6) gravelly clay; moderate fine subangular blocky structure; firm; few very fine roots; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; about 30 percent gravel; about 3 percent cobblestones; medium acid; clear wavy boundary.

Bt3—22 to 30 inches; dark brown (7.5YR 3/4) very gravelly clay; moderate medium subangular blocky structure; firm; thin continuous dark reddish brown (5YR 3/3) clay films on faces of peds; about 40 percent gravel; about 5 percent cobblestones; medium acid; clear wavy boundary.

Bt4—30 to 37 inches; dark reddish brown (5YR 3/4) very gravelly clay loam; weak medium subangular blocky structure; friable; thin discontinuous dark reddish brown (5YR 3/3) clay films on faces of peds; about 40 percent gravel; about 9 percent cobblestones; neutral; clear irregular boundary.

2C—37 to 60 inches; pale brown (10YR 6/3) extremely gravelly coarse sand; single grain; loose; about 60 percent gravel; about 15 percent cobblestones; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick. The content of gravel ranges from 0 to 30 percent in the A horizon and in the upper part of the Bt horizon and from 15 to 40 percent in the lower part of the Bt horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is loam, silt loam, or the gravelly analogs of those textures. The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 3 to 6. It is clay loam, clay, sandy clay, or the gravelly or very gravelly analogs of those textures. The 2C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is very gravelly coarse sand, very gravelly loamy coarse sand, extremely gravelly coarse sand, or extremely gravelly loamy coarse sand. The content of gravel in this horizon ranges from 40 to 70 percent. The content of cobbles ranges from 10 to 25 percent.

Elliott Series

The Elliott series consists of deep, somewhat poorly drained, moderately slowly permeable soils. These soils formed in silty sediments and glacial till on ground moraines and end moraines. Slopes range from 0 to 2 percent.

Elliott soils are similar to Blount and Williamsport soils and are adjacent to Drummer, Markham, Varna, and Williamsport soils. Blount soils have a surface layer that is thinner and lighter colored than that of the Elliott soils. Williamsport soils have a solum that is thicker than that of the Elliott soils. They are in landscape positions similar to those of the Elliott soils. Drummer soils are grayer in the subsoil than the Elliott soils. They are in the lower lying depressions. Markham and Varna soils are browner in the subsoil than the Elliott soils. They are in the more sloping positions on the landscape.

Typical pedon of Elliott silt loam, in a cultivated area of Williamsport-Elliott silt loams, 0 to 2 percent slopes; 600 feet north and 660 feet west of the center of sec. 23, T. 21 N., R. 10 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few medium and common fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few medium and common fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; many very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.

2Bt2—17 to 31 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct grayish brown (10YR 5/2) and few medium distinct yellowish brown (10YR 5/6) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; thin continuous grayish brown (2.5Y 5/2) clay films on faces of peds; few very dark grayish brown (10YR 3/2) organic fillings in old root channels; about 2 percent gravel; neutral; clear wavy boundary.

2BCt—31 to 42 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium faint grayish brown (2.5Y 5/2) mottles; weak coarse angular blocky structure; firm; thin patchy dark grayish brown (2.5Y 4/2) clay films on faces of peds; few very dark grayish brown (10YR 3/2) organic fillings in old root channels; about 3 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

2Cd—42 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium distinct gray (N 5/0) and yellowish brown (10YR 5/6) and common medium faint grayish brown (2.5Y 5/2) mottles; massive; firm; few light gray (10YR 7/2) accumulations of calcium carbonate; few yellowish red (5YR 5/8) iron accumulations; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 20 to 45 inches thick. The silty deposits are less than 20 inches thick. The Ap 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 Bt and 2Bt horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. The 2Bt horizon is silty clay loam, silty clay, or clay. The 2Cd horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is silty clay loam or silt loam in which the content of clay is more than 22 percent.

Elston Series

The Elston series consists of deep, well drained soils. These soils formed in outwash deposits on terraces. Permeability is moderately rapid in the upper part of the solum and very rapid in the lower part. Slopes range from 0 to 3 percent.

The Elston soils in this county are more acid in the surface horizon than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Elston soils are similar to Billett, Carmi, and Oshtemo soils. Billett soils have a solum that is thinner than that of the Elston soils, Carmi soils have more gravel in the solum, and Oshtemo soils have a lighter colored surface layer.

Typical pedon of Elston sandy loam, 0 to 3 percent slopes, in a cultivated field; 1,350 feet west and 150 feet south of the northeast corner of sec. 33, T. 20 N., R. 9 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many very fine roots; medium acid; abrupt smooth boundary.

A—9 to 19 inches; very dark brown (10YR 2/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common very fine roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

Bt1—19 to 25 inches; dark yellowish brown (10YR 3/4) sandy loam; weak fine subangular blocky structure; friable; few very fine roots; common very dark brown (10YR 2/2) root channels; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; about 2 percent gravel; strongly acid; clear wavy boundary.

Bt2—25 to 33 inches; dark yellowish brown (10YR 4/6) loamy sand; weak fine subangular blocky structure; very friable; thin dark brown (7.5YR 3/4) clay bridges between sand grains; about 2 percent gravel; strongly acid; clear wavy boundary.

BCt—33 to 41 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; thin dark brown (7.5YR 3/4) clay bridges between sand grains; about 1 percent gravel; strongly acid; clear wavy boundary.

BC1—41 to 51 inches; brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; about 1 percent gravel; strongly acid; clear wavy boundary.

BC2—51 to 70 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; about 3 percent gravel; common brown (7.5YR 4/4) lenses of loamy sand; strongly acid; clear irregular boundary.

2BC3—70 to 80 inches; dark brown (7.5YR 3/4) gravelly loamy sand; massive; very friable; about 25 percent gravel; few dark brown (7.5YR 3/4) lenses of sandy loam; neutral; clear irregular boundary.

The solum is 50 to more than 80 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. The content of gravel in this horizon ranges from 0 to 15 percent. The BC and BCt horizons have hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4.

Gilboa Series

The Gilboa series consists of deep, somewhat poorly drained soils. These soils formed in silty sediments, loamy outwash, and the underlying glacial till. They are on end moraines and ground moraines. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 2 percent.

Gilboa soils are similar to Brenton, La Hogue, and Williamsport soils and are adjacent to Barce, Corwin, and Montmorenci soils. Brenton soils have less sand in the subsoil than the Gilboa soils, La Hogue soils have more sand and less clay in the lower part of the solum, and Williamsport soils have more clay in the subsoil. Barce, Corwin, and Montmorenci soils are browner in the subsoil than the Gilboa soils. They are in the more sloping positions on the landscape.

Typical pedon of Gilboa silt loam, 0 to 2 percent slopes, in a cultivated field; 1,100 feet east and 1,900 feet south of the northwest corner of sec. 2, T. 23 N., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many very fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; very dark brown (10YR 2/2) silt loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; many very fine roots; about 1 percent gravel; slightly acid; clear wavy boundary.

Bt1—12 to 18 inches; brown (10YR 4/3) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; many very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic stains along root channels; about 1 percent gravel; slightly acid; clear wavy boundary.

2Bt2—18 to 29 inches; dark yellowish brown (10YR 4/6) clay loam; many fine faint yellowish brown (10YR 5/6) and many fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic stains along root channels; common black (10YR 2/1) accumulations of iron and manganese oxide; about 8 percent gravel; slightly acid; clear wavy boundary.

2Btg—29 to 45 inches; dark grayish brown (10YR 4/2) clay loam; many medium faint grayish brown (10YR 5/2) and many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 8 percent gravel; slightly acid; abrupt wavy boundary.

3B't—45 to 52 inches; brown (10YR 5/3) loam; common fine distinct brownish yellow (10YR 6/6) and many medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; about 3 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

3Cd—52 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (2.5Y 6/2) and common fine distinct brownish yellow (10YR 6/6) mottles; massive; firm; common white (10YR 8/1) accumulations of carbonate; about 4 percent gravel; strong effervescence; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. The silty deposits are less than 20 inches thick. The A 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. The content of gravel in this horizon ranges from 0 to 5 percent. The 2Bt and 2Btg horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 6. They are clay loam or loam. The content of gravel in these horizons ranges from 3 to 15 percent. The 3B't horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. The 3Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 4. The content of gravel in the 3B't and 3Cd horizons ranges from 2 to 10 percent.

Glenhall Series

The Glenhall series consists of deep, moderately well drained soils. These soils formed in silty sediments and loamy outwash on outwash plains. Permeability generally is moderate in the solum and moderately rapid in the underlying material. In the till substratum phase, however, it is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 1 to 4 percent.

Glenhall soils are similar to Billett and Tuscola soils and are adjacent to Brenton and La Hogue soils. Billett soils have less clay in the subsoil than the Glenhall soils, and Tuscola soils have a lighter colored surface layer. Brenton and La Hogue soils are in the lower lying positions on the landscape. Their subsoil is grayer than that of the Glenhall soils. Also, the subsoil of the Brenton soils has less sand.

Typical pedon of Glenhall silt loam, 1 to 4 percent slopes, eroded, in a cultivated field; 700 feet east and 300 feet north of the center of sec. 17, T. 23 N., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with dark yellowish brown (10YR 4/4) material from the subsoil; weak medium granular structure; friable; many very fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—8 to 17 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; friable; many very fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; medium acid; clear wavy boundary.

Bt2—17 to 32 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; common very fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; about 6 percent gravel; medium acid; clear wavy boundary.

Bt3—32 to 43 inches; yellowish brown (10YR 5/6) loam; few fine distinct grayish brown (10YR 5/2) and common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent gravel; slightly acid; clear wavy boundary.

2Bt4—43 to 50 inches; strong brown (7.5YR 5/6) gravelly sandy loam; common fine distinct gray (10YR 5/1) and many medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/8) clay bridging between sand grains; about 20 percent gravel; slightly acid; gradual wavy boundary.

3C—50 to 60 inches; light yellowish brown (10YR 6/4) loamy sand that has strata of sand and silt loam (cumulative thickness of silty strata is 2 to 3 inches); many medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/8) mottles; single grain sand and loamy sand and massive silt loam; loose and friable; about 9 percent gravel; mildly alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 3, and chroma of 1 or 2. It is silt loam or loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam, clay loam, sandy clay loam, or loam. The content of clay in this horizon ranges from 3 to 12 percent. The 2Bt horizon has hue of 7.5YR, value of 5, and chroma of 4 to 6. It is gravelly sandy loam or gravelly sandy clay loam. It ranges from 15 to 25 percent gravel. The 3C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is loamy sand, loamy fine sand, sand, or fine sand that has thin strata of silty or loamy material. The content of gravel in this horizon is 3 to 15 percent. A till substratum phase of this series is mapped in the county.

Gosport Series

The Gosport series consists of moderately deep, moderately well drained, slowly permeable soils. These soils formed in shale residuum on bedrock terrace breaks. Slopes range from 25 to 40 percent.

Gosport soils are similar to Weikert Variant soils and are adjacent to Beaucoup, High Gap Variant, Mudlavia, Piankeshaw Variant, and Shadeland Variant soils. Weikert Variant soils formed in material weathered from sandstone and contain more sand and less clay throughout than the Gosport soils. Beaucoup soils have a subsoil that is grayer than that of the Gosport soils and are not underlain by bedrock. They are in depressional areas at the base of steep breaks. High Gap Variant, Mudlavia, and Shadeland Variant soils are in the less sloping areas near the breaks. High Gap Variant soils have less clay in the subsoil than the Gosport soils, Mudlavia soils have more rock fragments in the solum and are not underlain by bedrock, and Shadeland Variant soils have a grayer subsoil. Piankeshaw Variant soils have less clay and more rock fragments in the solum than the Gosport soils and are not underlain by bedrock. They are at the base of breaks on flood plains.

Typical pedon of Gosport shaly silt loam, 25 to 40 percent slopes, in a wooded area; 2,300 feet south and 1,750 feet west of the northeast corner of sec. 9, T. 22 N., R. 6 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) shaly silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many very fine and fine roots; about 20 percent shale fragments; medium acid; abrupt smooth boundary.

Bw—4 to 24 inches; light yellowish brown (2.5Y 6/4) shaly silty clay loam; weak medium subangular blocky structure; friable; many very fine and fine roots; about 20 percent shale fragments; strongly acid; clear wavy boundary.

C—24 to 30 inches; light olive brown (2.5Y 5/4) shaly silty clay loam; massive; firm; about 20 percent shale fragments; strongly acid; gradual wavy boundary.

Cr—30 inches; partly weathered, thinly bedded shale that grades into unweathered shale at 33 inches; medium acid.

The solum is 20 to 40 inches thick. The content of coarse fragments ranges from 15 to 25 percent throughout the profile. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. The C horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 3 or 4.

Hennepin Series

The Hennepin series consists of deep, well drained, moderately slowly permeable soils. These soils formed in glacial till. They are on breaks on till plains. Slopes range from 30 to 70 percent.

Hennepin soils are adjacent to Alford, Cadiz, Morley, Rainsville, and Stonelick soils. Alford, Cadiz, Morley, and Rainsville soils are on flats on ridgetops. Alford and Cadiz soils have more silt and less sand in the subsoil than the Hennepin soils, and Morley and Rainsville soils have a thicker solum. Stonelick soils have less clay than the Hennepin soils. They are on the lower lying flood plains adjacent to the base of slopes.

Typical pedon of Hennepin loam, 30 to 70 percent slopes, in a wooded area; 800 feet east and 600 feet south of the northwest corner of sec. 23, T. 22 N., R. 8 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many medium and fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

Bt—3 to 13 inches; brown (10YR 5/3) loam; moderate medium subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films on faces of peds; many medium and fine roots; strong effervescence; mildly alkaline; clear wavy boundary.

Cd—13 to 60 inches; brown (10YR 5/3) loam; massive; very firm; many medium and coarse roots; violent effervescence; moderately alkaline.

The solum is 10 to 20 inches thick. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loam, silt loam, or clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The Cd horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is silt loam or loam.

High Gap Series

The High Gap series consists of moderately deep, well drained, moderately permeable soils. These soils formed in silty sediments, glacial drift, and sandstone residuum on bedrock terraces. Slopes range from 2 to 9 percent.

High Gap soils are similar to High Gap Variant soils and are adjacent to Shadeland Variant and Weikert Variant soils. High Gap Variant soils formed in glacial outwash over residuum. Shadeland Variant soils are grayer than the High Gap soils and have more clay in the subsoil. They are in the lower lying positions on the landscape. Weikert Variant soils have less clay in the solum than the High Gap soils. They are on the steeper slopes.

Typical pedon of High Gap silt loam, 2 to 9 percent slopes, stony, in a wooded area; 200 feet east and 800 feet north of the southwest corner of sec. 14, T. 21 N., R. 8 W.

A—0 to 5 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine and medium roots; less then 0.1 percent stones ranging up to 15 inches in diameter; medium acid; clear wavy boundary.

BE—5 to 8 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine and medium roots; thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt1—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; many fine and medium roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; gradual wavy boundary.

2Bt2—14 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; thin continuous brown (10YR 5/3) clay films on faces of peds; about 18 percent sand; very strongly acid; clear wavy boundary.

2Bt3—22 to 30 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; thin continuous brown (10YR 5/3) clay films on faces of peds; about 18 percent sand; about 5 percent sandstone fragments; very strongly acid; clear wavy boundary.

3BC—30 to 34 inches; yellowish brown (10YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 10 percent sandstone fragments; very strongly acid; abrupt wavy boundary.

Cr—34 to 38 inches; yellowish brown (10YR 5/4) weathered sandstone that crushes easily to sandy loam; massive; friable; very strongly acid; clear wavy boundary.

R—38 inches; unweathered sandstone bedrock; very strongly acid.

The thickness of the solum ranges from 24 to 40 inches. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is silt loam or loam. The Bt and 2Bt horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon either is silty clay loam that has a noticeable sand content or is clay loam. The content of coarse fragments ranges from 0 to 5 percent in the 2Bt horizon and from 2 to 15 percent in the 3BC horizon. The 3BC horizon is sandy clay loam or sandy loam. It has colors similar to those of the 2Bt horizon, but the chroma ranges to 8.

High Gap Variant

The High Gap Variant consists of moderately deep, moderately well drained soils. These soils formed in glacial outwash over shale residuum. They are on bedrock terraces. Permeability is moderately slow or slow. Slopes range from 2 to 12 percent.

High Gap Variant soils are similar to High Gap soils and are adjacent to Gosport, Piankeshaw Variant, and Shadeland Variant soils. High Gap soils formed in silty deposits, glacial drift, and sandstone residuum. Gosport soils have more clay in the subsoil than the High Gap Variant soils. They are on the steeper breaks. Piankeshaw Variant soils have less clay and more rock fragments than the High Gap Variant soils. They are not underlain by bedrock. They are in the lower lying positions on flood plains, adjacent to the base of slopes. Shadeland Variant soils are grayer than the High Gap Variant soils and have more clay in the subsoil. They are in the less sloping areas.

Typical pedon of High Gap Variant loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,000 feet north and 150 feet west of the southeast corner of sec. 8, T. 22 N., R. 6 W.

Ap—0 to 8 inches; brown (10YR 5/3) loam, very pale brown (10YR 7/3) dry; mixed with yellowish brown (10YR 5/4) clay loam from the subsoil; weak medium subangular blocky structure; friable; many very fine roots; about 6 percent gravel; medium acid; abrupt smooth boundary.

Bt1—8 to 15 inches; yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; friable; common very fine roots; thin discontinuous brown (10YR 5/3) clay films on faces of peds; about 3 percent gravel; very strongly acid; clear wavy boundary.

Bt2—15 to 24 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct brownish yellow (10YR 6/8) mottles; weak fine subangular blocky structure; friable; few very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 6 percent gravel; very strongly acid; clear wavy boundary.

Bt3—24 to 31 inches; yellowish brown (10YR 5/6) sandy clay; common fine distinct light brownish gray (10YR 6/2) and many fine distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure parting to weak fine subangular blocky; friable; few very fine roots; thin discontinuous dark yellowish brown (10YR 4/6) clay films on faces of peds; many black (N 2/0) iron and manganese accumulations; about 14 percent gravel; very strongly acid; abrupt smooth boundary.

2C—31 to 36 inches; light yellowish brown (2.5Y 6/4) very shaly silty clay loam; many medium distinct light gray (2.5Y 7/2) and yellowish brown (10YR 5/8) mottles; massive; firm; about 40 percent shale fragments; very strongly acid; clear wavy boundary.

2Cr—36 to 40 inches; partly weathered, thinly bedded shale that grades into unweathered shale at 39 inches; medium acid.

The solum is 20 to 40 inches thick. The content of coarse fragments ranges from 0 to 15 percent in the solum and from 15 to 45 percent in the underlying material. 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 6. It is clay loam, sandy clay loam, sandy clay, or loam. Some pedons have a 2BC horizon, which formed in the shale residuum. The 2C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 3 or 4. It is very shaly silty clay loam or shaly silty clay.

Houghton Series

The Houghton series consists of deep, very poorly drained soils on ground moraines. These soils formed in organic deposits. Permeability is moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Houghton soils are adjacent to Drummer, Peotone, Wallkill Variant, and Warners Variant soils in the slightly higher lying areas. Drummer, Peotone, and Warners Variant soils formed in mineral material. Wallkill Variant soils formed in mineral deposits less than 40 inches deep over organic deposits.

Typical pedon of Houghton muck, undrained, in an uncultivated field; 1,100 feet east and 800 feet south of the center of sec. 14, T. 23 N., R. 7 W.

Oa1—0 to 10 inches; sapric material, very dark brown (10YR 2/2) broken face and rubbed; about 35 percent fiber, 4 percent rubbed; weak medium granular structure; friable; many fine and very fine roots; mostly herbaceous fibers; about 5 percent mineral material; neutral; abrupt wavy boundary.

Oa2—10 to 15 inches; sapric material, very dark brown (10YR 2/2) broken face, very dark grayish brown (10YR 3/2) rubbed; about 35 percent fiber, 5 percent rubbed; moderate fine subangular blocky structure; friable; many fine and very fine roots; mostly herbaceous fibers; about 4 percent mineral material; slightly acid; abrupt wavy boundary.

Oa3—15 to 30 inches; sapric material, black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed; about 40 percent fiber, 7 percent rubbed; moderate medium platy structure; friable; common very fine roots; mostly herbaceous fibers; about 2 percent mineral material; slightly acid; clear wavy boundary.

Oa4—30 to 45 inches; sapric material, dark brown (7.5YR 3/2) broken face, very dark brown (7.5YR 2/2) rubbed; about 38 percent fiber, 5 percent rubbed; moderate medium platy structure; friable; few very fine roots; mostly herbaceous fibers; about 1 percent mineral material; slightly acid; clear wavy boundary.

Oa5—45 to 60 inches; sapric material, very dark grayish brown (10YR 3/2) broken face, very dark brown (10YR 2/2) rubbed; about 42 percent fiber, 8 percent rubbed; weak medium platy structure; friable; mostly herbaceous fibers; about 1 percent mineral material; neutral.

The organic material is more than 51 inches thick. It is mainly herbaceous. The surface tier has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue. The fiber content in this tier is generally less than 5 percent after rubbing. The content of mineral material is as much as 10 percent. The subsurface and bottom tiers have hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3, or they are neutral in hue. They are mainly sapric material. In some pedons, however, they have thin layers of hemic material with a combined thickness of less than 10 inches. The fiber content in these tiers is generally less than 12 percent after rubbing. The content of mineral material is as much as 4 percent.

Iona Series

The Iona series consists of deep, moderately well drained, moderately permeable soils. These soils formed in loess on ground moraines. Slopes range from 1 to 4 percent.

The Iona soils in this county are grayer in the upper part of the subsoil than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Iona soils are similar to Cadiz and Alford soils and are adjacent to Ipava, Ragsdale, and Reesville soils. Alford and Cadiz soils do not have gray mottles in the upper part of the subsoil. Alford soils are on slight rises. Ipava soils have a surface layer that is thicker and darker than that of the Iona soils and have a grayer, more clayey subsoil. Reesville soils are grayer in the subsoil than the Iona soils. Ipava and Reesville soils are in the lower lying positions on the landscape. Ragsdale soils have a surface layer that is thicker and darker than that of the Iona soils and have a grayer subsoil. They are in depressional areas.

Typical pedon of Iona silt loam, 1 to 4 percent slopes, eroded, in a cultivated field; 1,800 feet west and 2,300 feet north of the southeast corner of sec. 32, T. 20 N., R. 9 W.

Ap—0 to 9 inches; yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; mixed with dark yellowish brown (10YR 4/4) silty clay loam from the subsoil; weak fine granular structure; friable; many very fine roots; medium acid; abrupt smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common very fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous light yellowish brown (10YR 6/4) silt coatings on faces of peds; strongly acid; clear wavy boundary.

Bt2—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct light brownish gray (10Y 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous light yellowish brown (10YR 6/4) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt3—21 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; 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;

strongly acid; gradual wavy boundary.

Bt4—29 to 44 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) and common fine distinct pale brown (10YR 6/3) mottles; moderate coarse subangular blocky structure; friable; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; slightly acid; gradual wavy boundary.

BC—44 to 55 inches; light yellowish brown (10YR 6/4) silt loam; common fine distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) and many medium faint yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; friable; common reddish brown (5YR 4/3) accumulations of iron and manganese oxide; neutral; gradual wavy boundary.

C—55 to 60 inches; light yellowish brown (10YR 6/4) silt loam; common fine distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; massive; friable; common dark reddish brown (5YR 3/2) accumulations of iron and manganese oxide; slight effervescence; mildly alkaline.

The solum is 45 to 60 inches thick. The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. The BC horizon has hue of 10YR and value and chroma 4 to 6. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6.

Ipava Series

The Ipava series consists of deep, somewhat poorly drained, moderately slowly permeable soils. These soils formed in loess on ground moraines. Slopes range from 0 to 2 percent.

Ipava soils are similar to Blount and Williamsport soils and are adjacent to Iona and Sable soils. Blount soils have a surface layer that is thinner and lighter colored than that of the Ipava soils, and Williamsport soils have more sand in the lower part of the subsoil. Iona soils have a surface layer that is thinner and lighter colored than that of the Ipava soils and have a browner, less clayey subsoil. They are in the higher lying positions on the landscape. Sable soils have less clay than the Ipava soils and have a grayer subsoil. They are in the lower lying positions on the landscape.

Typical pedon of Ipava silt loam, 0 to 2 percent slopes, in a cultivated field; 775 feet east and 2,500 feet north of the southwest corner of sec. 32, T. 20 N., R. 10 W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; many fine and very fine roots; medium acid; abrupt wavy boundary.

Bt—12 to 18 inches; pale brown (10YR 6/3) silty clay; few fine distinct yellowish brown (10YR 5/6) and common fine faint light brownish gray (10YR 6/2) mottles; moderate fine angular blocky structure; firm; common very fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; many black (10YR 2/1) krotovinas and root channels; slightly acid; gradual wavy boundary.

Btg1—18 to 26 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/8) and light yellowish brown (10YR 6/4) mottles; moderate medium angular blocky structure; firm; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common black (10YR 2/1) krotovinas and root channels; slightly acid; clear wavy boundary.

Btg2—26 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine distinct yellowish brown (10YR 5/8) and common fine distinct light yellowish brown (10YR 6/4) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; few black (10YR 2/1) krotovinas and root channels; neutral; clear wavy boundary.

BC—30 to 37 inches; light yellowish brown (2.5Y 6/4) silt loam; common medium faint light brownish gray (2.5Y 6/2) and many fine distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few dark gray (10YR 4/1) krotovinas; slight effervescence; mildly alkaline; clear wavy boundary.

C1—37 to 45 inches; light yellowish brown (2.5Y 6/4) silt loam; many medium faint light brownish gray (2.5Y 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; few white (10YR 8/2) accumulations of calcium carbonate; few dark gray (10YR 4/1) krotovinas; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—45 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam; many medium distinct yellowish brown (10YR 5/6) and many medium faint light brownish gray (2.5Y 6/2) mottles; massive; firm; few very dark gray (10YR 3/1) accumulations of iron and manganese oxide; few white (10YR 8/2) accumulations of calcium carbonate; strong effervescence; moderately alkaline.

The solum is 34 to 40 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt and Btg horizons have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. The BC horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. The C horizon has hue of 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Jules Series

The Jules series consists of deep, well drained, moderately permeable soils. These soils formed in silty alluvium on flood plains. Slopes range from 0 to 2 percent.

The Jules soils in this county contain more clay than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Jules soils are adjacent to Armiesburg Variant, Moundhaven, and Stonelick soils. Armiesburg Variant soils have more clay in the solum than the Jules soils and have a darker surface layer. They are in the lower lying positions on the landscape. Moundhaven and Stonelick soils are in the slightly higher lying positions on the landscape. Moundhaven soils have less clay than the Jules soils, and Stonelick soils have less silt and more sand in the solum.

Typical pedon of Jules silt loam, frequently flooded, in a cultivated field; 460 feet east and 280 feet south of the center of sec. 1, T. 20 N., R. 9 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine and very fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

Bw1—10 to 15 inches; brown (10YR 4/3) silt loam; weak coarse subangular blocky structure parting to moderate medium granular; friable; common fine and very fine roots; thin continuous dark grayish brown (10YR 4/2) organic coatings on faces of peds and filling voids; strong effervescence; moderately alkaline; clear smooth boundary.

Bw2—15 to 24 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; common very fine roots; thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds and filling voids; strong effervescence; moderately alkaline; gradual smooth boundary.

Bw3—24 to 34 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; few very fine roots; thin patchy dark grayish brown (10YR 4/2) organic coatings on faces of peds and filling voids; strong effervescence; moderately alkaline; gradual smooth boundary.

C1—34 to 44 inches; brown (10YR 4/3) silty clay loam; massive; friable; few dark grayish brown (10YR 4/2) fillings in voids; few white (10YR 8/1) shell fragments; slight effervescence; moderately alkaline; gradual smooth boundary.

C2—44 to 54 inches; brown (10YR 4/3) silty clay loam; massive; friable; few white (10YR 8/1) shell fragments; strong effervescence; moderately alkaline; gradual smooth boundary.

C3—54 to 60 inches; brown (10YR 4/3) silty clay loam; massive; friable; common light gray (10YR 7/1) shell fragments; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bw and C horizons are silt loam or silty clay loam. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4.

Lafayette Series

The Lafayette series consists of deep, somewhat poorly drained soils. These soils formed in silty sediments, loamy outwash, and gravelly outwash on outwash plains and terraces. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 2 percent.

Lafayette soils are similar to Brenton soils and are adjacent to Comfrey, Drummer, and Waupecan soils. Brenton soils have less gravel in the lower part of the subsoil and in the underlying material than the Lafayette soils. Comfrey and Drummer soils are grayer in the subsoil than the Lafayette soils. Comfrey soils are in the lower lying depressions on flood plains. Drummer soils are in the lower lying depressions on terraces. Waupecan soils do not have gray mottles in the upper part of the subsoil. They are in the slightly higher or more sloping areas.

Typical pedon of Lafayette silt loam, 0 to 2 percent slopes, in a cultivated field; 1,800 feet west and 400 feet north of the southeast corner of sec. 8, T. 22 N., R. 9 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many very fine roots; medium acid; abrupt smooth boundary.

A—10 to 13 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; many very fine roots; slightly acid; clear wavy boundary.

Bt1—13 to 22 inches; brown (10YR 4/3) silty clay loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; many very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear wavy boundary.

Bt2—22 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear wavy boundary.

2Bt3—33 to 47 inches; yellowish brown (10YR 5/4) sandy clay loam; many medium distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common medium yellowish red (5YR 5/6) accumulations of iron and manganese oxide; about 10 percent gravel; slightly acid; clear wavy boundary.

3Bt4—47 to 61 inches; brown (10YR 5/3) gravelly sandy loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; clay bridging between sand grains; many medium yellowish red (5YR 5/6) accumulations of iron and manganese oxide; about 20 percent gravel; neutral; clear wavy boundary.

3Cg—61 to 70 inches; grayish brown (10YR 5/2) very gravelly coarse sand; single grain; loose; about 40 percent gravel; slight effervescence; moderately alkaline.

The solum ranges from 60 to 70 inches in thickness. The silty material ranges from 24 to 40 inches in thickness. The Ap and A horizons have hue of 10YR, value of 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is 5 to 15 percent gravel. The 3Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is 15 to 35 percent gravel. The 3Cg horizon has hue of 10YR, value of 5, and chroma of 2 or 3. It is gravelly loamy coarse sand, very gravelly coarse sand, or gravelly coarse sand. It is 25 to 50 percent gravel.

La Hogue Series

The La Hogue series consists of deep, somewhat poorly drained soils. These soils formed in loamy outwash deposits on ground moraines. Permeability is moderate in the upper part of the solum and moderate or moderately rapid in the lower part and in the underlying material. In the till substratum phase, however, it is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 0 to 2 percent.

La Hogue soils are similar to Brenton and Gilboa soils and are adjacent to Billett and Glenhall soils. Brenton soils contain less sand in the subsoil than the La Hogue soils, and Gilboa soils contain less sand and more clay in the lower part of the solum. Billett and Glenhall soils are in the slightly higher, more sloping positions on the landscape. Their subsoil is browner than that of the La Hogue soils. Also, the subsoil of the Billett soils has less clay.

Typical pedon of La Hogue silt loam, 0 to 2 percent slopes, in a cultivated field; 2,300 feet west and 580 feet north of the southeast corner of sec. 13, T. 22 N., R. 10 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many very fine and fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

A—8 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; many fine and very fine roots; about 1 percent gravel; slightly acid; clear wavy boundary.

Bt1—11 to 29 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 2 percent gravel; medium acid; clear wavy boundary.

Bt2—29 to 43 inches; yellowish brown (10YR 5/4) loam; many medium faint yellowish brown (10YR 5/6) and many fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 2 percent gravel; slightly acid; clear wavy boundary.

BC—43 to 50 inches; yellowish brown (10YR 5/4) sandy loam that has thin strata of loamy sand and loam; many medium distinct light brownish gray (10YR 6/2) and many medium faint yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; very friable; common dark brown (10YR 3/3) organic coatings on faces of peds; few black (10YR 2/1) accumulations of iron and manganese oxide; few strong brown (7.5YR 5/8) iron accumulations; about 2 percent gravel; neutral; gradual wavy boundary.

C—50 to 60 inches; brown (10YR 5/3) fine sandy loam that has thin strata of loamy sand and fine sand; common medium faint yellowish brown (10YR 5/4) and common medium distinct light brownish gray (10YR 6/2) mottles; massive; very friable; about 3 percent gravel; neutral.

The solum 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 loam or silt loam. The Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It is commonly clay loam, loam, or sandy clay loam, but in some pedons the upper part is silty clay loam. The BC horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is fine sandy loam, sandy loam, loam, or silt loam that has strata of sandy material. A till substratum phase of this series is mapped in the county.

Landes Series

The Landes series consists of deep, well drained soils. These soils formed in alluvium on flood plains. Permeability is moderately rapid in the solum and rapid in the underlying material. Slopes range from 0 to 2 percent.

Landes soils are similar to Stonelick soils and are adjacent to Chatterton, Moundhaven, Ormas, and Oshtemo soils. Moundhaven and Stonelick soils have a surface layer that is lighter colored than that of the Landes soils. Chatterton and Moundhaven soils have less clay in the solum than the Landes soils. They are in the slightly higher lying positions on the landscape. Ormas and Oshtemo soils have more gravel than the Landes soils. They are on nearby terraces.

Typical pedon of Landes fine sandy loam, in a cultivated area of Landes-Chatterton complex, frequently flooded; 1,600 feet west and 500 feet north of the center of sec. 23, T. 21 N., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, brown (10YR 5/3) dry; moderate fine granular structure; very friable; many very fine roots; neutral; abrupt smooth boundary.

A—8 to 11 inches; very dark grayish brown (10YR 3/2) fine sandy loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; very friable; many very fine roots; neutral; clear smooth boundary.

Bw1—11 to 24 inches; dark brown (10YR 4/3) fine sandy loam; moderate fine subangular blocky structure; very friable; common very fine roots; thin continuous dark brown (10YR 3/3) organic coatings on faces of peds; about 1 percent gravel; mildly alkaline; clear wavy boundary.

Bw2—24 to 30 inches; dark yellowish brown (10YR 4/4) fine sandy loam; moderate fine subangular blocky structure; very friable; common very fine roots; thin discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; about 1 percent gravel; mildly alkaline; clear wavy boundary.

Bw3—30 to 38 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; few very fine roots; about 3 percent gravel; slight effervescence; moderately alkaline; clear wavy boundary.

C—38 to 60 inches; dark yellowish brown (10YR 4/4) stratified loamy sand; massive; very friable; thin strata of sand and sandy loam; about 10 percent gravel; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 25 to 40 inches. The A horizon has hue of 10YR and value and chroma of 2 or 3. It is fine sandy loam or sandy loam. The Bw horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is dominantly fine sandy loam or sandy loam, but in some pedons the lower part is loamy fine sand. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is loamy sand, loamy fine sand, sand, or fine sand and has thin strata of silty and loamy material.

Markham Series

The Markham series consists of deep, moderately well drained, moderately slowly permeable soils. These soils formed in silty sediments and glacial till on ground moraines and end moraines. Slopes range from 2 to 6 percent.

Markham soils are similar to Montmorenci, Morley, and Varna soils and are adjacent to Drummer, Elliott, and Symerton soils. Montmorenci soils have less clay in the subsoil than the Markham soils, and Morley soils have a lighter colored surface layer. Drummer and Elliott soils are grayer in the subsoil than the Markham soils. Also, Drummer soils have less clay in the subsoil. They are in depressional areas. Elliott soils are in the slightly lower lying areas. Symerton and Varna soils have a surface layer that is thicker than that of the Markham soils. Also, Symerton soils have less clay in the upper part of the subsoil. They are in positions on the landscape similar to those of the Markham soils.

Typical pedon of Markham silt loam, in a cultivated area of Markham-Symerton silt loams, 2 to 6 percent slopes, eroded; 360 feet east and 2,120 feet south of the northwest corner of sec. 8, T. 21 N., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with yellowish brown (10YR 5/4) silty clay loam from the subsoil; weak fine subangular blocky structure parting to weak medium granular; friable; common medium and fine roots; strongly acid; abrupt smooth boundary.

Bt1—8 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure parting to moderate fine subangular blocky; friable; common medium and fine roots; thin patchy brown (10YR 4/3) clay films on faces of peds; many very dark grayish brown (10YR 3/2) organic stains in root channels and on faces of peds; medium acid; clear wavy boundary.

2Bt2—13 to 22 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common medium and fine roots; thin discontinuous olive brown (2.5Y 4/4) clay films on faces of peds and following root channels; few very dark grayish brown (10YR 3/2) organic stains in root channels; about 1 percent gravel; slightly acid; clear wavy boundary.

2Bt3—22 to 32 inches; light olive brown (2.5Y 5/4) silty clay loam; few fine faint grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few medium and fine roots; thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds and following root channels; few very dark grayish brown (10YR 3/2) organic stains in root channels; about 1 percent gravel; neutral; clear wavy boundary.

2Bt4—32 to 38 inches; olive brown (2.5Y 4/4) silty clay loam; few fine distinct light olive brown (2.5Y 5/6) and grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin patchy dark grayish brown (2.5Y 4/2) clay films on faces of peds and within pores; few yellowish red (5YR 5/8) iron segregations; few very dark grayish brown (10YR 3/2) organic stains in root channels; about 1 percent gravel; mildly alkaline; clear irregular boundary.

2Cd—38 to 60 inches; light olive brown (2.5Y 5/4) silt loam; massive; very firm; few yellowish red (5YR 5/8) iron segregations; few white (10YR 8/1) accumulations of calcium carbonate; about 4 percent gravel; slight effervescence; moderately alkaline.

The solum is 20 to 45 inches thick. The A horizon has hue of 10YR, value of 3, and chroma of 1 to 3. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5. It has chroma of 3 or 4 in the upper part and chroma of 2 to 4 in the lower part. It is silty clay loam or silty clay. The 2Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. It is silty clay loam or silt loam in which the content of clay is more than 22 percent.

Martinsville Series

The Martinsville series consists of deep, well drained soils. These soils formed in loamy outwash on terraces. Permeability is moderate in the solum and moderately rapid or moderate in the underlying material. Slopes range from 0 to 12 percent.

Martinsville soils are similar to Camden, Ockley, and Tuscola soils and are adjacent to Rodman and Starks soils. Camden and Starks soils have less sand in the solum than the Martinsville soils, and Ockley soils have more gravel in the lower part of the solum. Tuscola soils have gray mottles in the lower part of the subsoil. Rodman soils have a solum that is thinner than that of the Martinsville soils and have more gravel throughout. They are on steep and very steep breaks on terraces. Starks soils are grayer in the subsoil than the Martinsville soils. They are in the lower lying positions on the landscape.

Typical pedon of Martinsville loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,450 feet west and 400 feet north of the southeast corner of sec. 13, T. 23 N., R. 8 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/4) loam from the subsoil; weak medium granular structure; friable; many very fine roots; medium acid; abrupt smooth boundary.

BE—6 to 11 inches; yellowish brown (10YR 5/4) loam; moderate medium granular structure; friable; many very fine roots; slightly acid; clear smooth boundary.

Bt1—11 to 25 inches; strong brown (7.5YR 5/6) clay loam; weak medium subangular blocky structure; friable; common very fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—25 to 43 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common very fine roots; thin continuous brown (7.5YR 5/4) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; medium acid; clear smooth boundary.

Bt3—43 to 56 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; firm; few very fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; few black (10YR 2/1) accumulations of iron and manganese oxide; slightly acid; clear wavy boundary.

C—56 to 60 inches; yellowish brown (10YR 5/4) sandy loam; massive; friable; common thin strata of silt loam, loam, and loamy sand; neutral.

The solum ranges from 40 to 60 inches in thickness. The A 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 has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is clay loam or sandy clay loam in the upper part and sandy clay loam, loam, or sandy loam in the lower part. The content of gravel in this horizon ranges from 0 to 5 percent. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is sandy loam, loam, or silt loam and has sandy strata.

Miami Series

The Miami series consists of deep, well drained soils. These soils formed in glacial till on ground moraines and end moraines. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 6 to 25 percent.

Miami soils are similar to Strawn soils and are adjacent to Rainsville, Rockfield, Wakeland Variant, Washtenaw, and Williamstown soils. The solum of the Strawn soils is thinner than that of the Miami soils, and the solum of the Rainsville and Rockfield soils is thicker. Rainsville and Rockfield soils are in the less sloping areas. Wakeland Variant and Washtenaw soils are grayer than the Miami soils and have less sand. They are in the lower lying positions adjacent to the base of slopes. Williamstown soils have gray mottles in the lower part of the subsoil. They are in the less sloping positions on the landscape.

Typical pedon of Miami clay loam, 6 to 12 percent slopes, severely eroded, in a cultivated field; 250 feet west and 1,600 feet south of the northeast corner of sec. 9, T. 22 N., R. 7 W.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) clay loam, light yellowish brown (10YR 6/4) dry; mixed with yellowish brown (10YR 5/4) clay loam from the subsoil; weak fine granular structure; friable; many very fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—6 to 12 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; many very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent gravel; medium acid; clear wavy boundary.

Bt2—12 to 20 inches; light olive brown (2.5Y 5/4) clay loam; moderate medium subangular blocky structure; friable; common very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

BCt—20 to 25 inches; light olive brown (2.5Y 5/4) loam; moderate coarse subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 3 percent gravel; neutral; gradual wavy boundary.

Cd—25 to 60 inches; light yellowish brown (2.5Y 6/4) loam; massive; firm; about 5 percent gravel; slight effervescence; mildly alkaline.

The solum is 24 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Pedons in uncultivated areas have an A horizon, which has hue of 10YR, value of 3, and chroma of 1 or 2. The Ap or A horizon is silt loam or loam in the less eroded areas and clay loam in severely eroded areas. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. The Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4.

Milford Series

The Milford series consists of deep, very poorly drained, moderately slowly permeable soils. These soils formed in lacustrine sediments on end moraines and ground moraines. Slopes range from 0 to 2 percent.

Milford soils are similar to Peotone soils and are adjacent to Montmorenci, Starks, Warners Variant, and Washtenaw soils. Peotone soils have a surface layer that is thicker than that of the Milford soils. Montmorenci soils have less clay in the subsoil than the Milford soils and are browner. They are in the more sloping areas. Starks soils have a surface layer that is lighter colored than that of the Milford soils and have a browner subsoil. They are in the slightly higher lying positions on the landscape. Warners Variant and Washtenaw soils have less clay in the subsoil than the Milford soils. They are in the less concave areas.

Typical pedon of Milford silty clay loam, pothole, in a hay field; 1,650 feet north and 2,300 feet west of the southeast corner of sec. 9, T. 22 N., R. 7 W.

Ap—0 to 11 inches; black (N 2/0) silty clay loam, olive gray (5Y 4/2) dry; moderate fine subangular blocky structure; firm; many very fine roots; neutral; clear wavy boundary.

A—11 to 16 inches; black (N 2/0) silty clay loam, dark grayish brown (2.5Y 4/2) dry; moderate fine subangular blocky structure; firm; many very fine roots; few dark brown (7.5YR 4/4) iron and manganese accumulations; neutral; clear wavy boundary.

Bg1—16 to 30 inches; dark gray (5Y 4/1) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; thin discontinuous very dark gray (N 3/0) organic films on faces of peds; common dark brown (7.5YR 4/4) iron and manganese accumulations; neutral; gradual wavy boundary.

Bg2—30 to 55 inches; gray (5Y 5/1) silty clay loam; common fine distinct light olive brown (2.5Y 5/6) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; thin discontinuous very dark gray (N 3/0) organic films on faces of peds; common dark brown (7.5YR 4/4) iron and manganese accumulations; neutral; gradual wavy boundary.

Cg—55 to 60 inches; gray (10YR 6/1) silty clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; common dark brown (7.5YR 4/4) iron and manganese accumulations; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 36 to 60 inches. The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue. It is silty clay loam or silt loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2, or it is neutral in hue. It is silty clay loam or silty clay. The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is dominantly silty clay loam or silt loam. In some pedons, however, it has thin layers of coarser textured material.

Millbrook Series

The Millbrook series consists of deep, somewhat poorly drained soils. These soils formed in silty sediments and outwash deposits on ground moraines. Permeability is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 0 to 2 percent.

Millbrook soils are similar to Starks soils and are adjacent to Camden, Proctor, and Rockfield soils. Starks soils have a surface layer that is lighter colored than that of the Millbrook soils. Camden, Proctor, and Rockfield soils are browner in the subsoil than the Millbrook soils. They are in the higher lying areas.

Typical pedon of Millbrook silt loam, till substratum, 0 to 2 percent slopes, in a cultivated field; 180 feet east and 2,000 feet south of the center of sec. 9, T. 23 N., R. 6 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common very fine and fine roots; medium acid; abrupt smooth boundary.

Btg—8 to 23 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct brown (10YR 5/3) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; friable; common very fine and fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; medium acid; abrupt smooth boundary.

Bt1—23 to 32 inches; brown (10YR 5/3) silty clay loam; many fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/8) mottles; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; few very fine roots; thin continuous gray (10YR 5/1) clay films on faces of peds; medium acid; clear wavy boundary.

2Bt2—32 to 42 inches; yellowish brown (10YR 5/6) loam; many medium distinct grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; thin discontinuous gray (10YR 6/1) clay films on faces of peds; about 3 percent gravel; slightly acid; clear wavy boundary.

2BC—42 to 48 inches; yellowish brown (10YR 5/4) loam; common medium light brownish gray (10YR 6/2) and common fine faint yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin lenses of sandy loam, loamy sand, and silt loam (2 inches total thickness); about 3 percent gravel; slightly acid; clear wavy boundary.

2C—48 to 57 inches; yellowish brown (10YR 5/4) sandy loam; common medium faint brown (10YR 5/3) and common medium distinct light brownish gray (10YR 6/2) mottles; massive; very friable; thin lenses of sand, loamy fine sand, and loam (4 inches total thickness); about 3 percent gravel; slight effervescence; mildly alkaline; abrupt irregular boundary.

3Cd—57 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; firm; about 4 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty deposits are 24 to 40 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. The 2Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6. It is clay loam, loam, or sandy loam. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6. It is sandy loam, loam, or silt loam and has thin strata of sandy material. The 3Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Montmorenci Series

The Montmorenci series consists of deep, moderately well drained soils. These soils formed in glacial till on end moraines and ground moraines. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 12 percent.

The Montmorenci soils in this county are browner in the upper part of the subsoil than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Montmorenci soils are similar to Barce, Corwin, and Markham soils and are adjacent to Barce, Brenton, Gilboa, and Milford soils. Barce soils have more sand in the upper part of the subsoil than the Montmorenci soils and have a thicker solum. They are in landscape positions similar to those of the Montmorenci soils. Corwin soils have a surface layer that is thicker than that of the Montmorenci soils, and Markham soils have more clay in the subsoil. Brenton soils have less sand in the subsoil than the Montmorenci soils. Brenton and Gilboa soils are in the less sloping areas. Milford soils have more clay in the subsoil than the Montmorenci soils and are grayer. They are in potholes on the landscape.

Typical pedon of Montmorenci silt loam, in a cultivated area of Barce-Montmorenci silt loams, 2 to 6 percent slopes, eroded; 1,200 feet north and 150 feet west of the southeast corner of sec. 12, T. 22 N., R. 9 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; mixed with dark yellowish brown (10YR 4/4) loam from the subsoil; moderate medium granular structure; friable; many very fine and fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—8 to 17 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; friable; few very fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic flows along root channels; about 3 percent gravel; slightly acid; clear wavy boundary.

Bt2—17 to 30 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; slightly acid; clear wavy boundary.

Bt3—30 to 36 inches; yellowish brown (10YR 5/4) loam;

common medium distinct yellowish brown (10YR 5/8) and common fine distinct light brownish gray (10YR 6/2) mottles; weak moderate subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds and along root channels; few strong brown (7.5YR 5/8) iron accumulations; about 3 percent gravel; neutral; clear wavy boundary.

Cd—36 to 60 inches; light olive brown (2.5Y 5/4) loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/8) mottles; massive; firm; few black (10YR 2/1) accumulations of iron and manganese oxide; few strong brown (7.5YR 5/8) iron accumulations; few white (10YR 8/1) accumulations of calcium carbonate; about 4 percent gravel; slight effervescence; mildly alkaline.

The solum ranges from 24 to 40 inches in thickness. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is silt loam or loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly loam or clay loam, but in some pedons the upper part is silty clay loam. The Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Morley Series

The Morley series consists of deep, moderately well drained, moderately slowly permeable soils. These soils formed in silty sediments and glacial till on end moraines. Slopes range from 6 to 25 percent.

Morley soils are similar to Cadiz and Markham soils and are adjacent to Beckville, Blount, Cadiz, and Hennepin soils. Cadiz soils have less clay in the subsoil than the Morley soils. They are in landscape positions similar to those of the Morley soils. Markham soils have a surface layer that is darker than that of the Morley soils. Beckville and Blount soils are grayer in the subsoil than the Morley soils. Also, Beckville soils have less clay. They are in the lower lying positions on the flood plains, adjacent to the base of slopes. Blount soils are in the less sloping areas on uplands. Hennepin soils have a solum that is thinner than that of the Morley soils. They are on the steeper breaks.

Typical pedon of Morley silt loam, in a cultivated area of Morley-Cadiz silt loams, moderately wet, 6 to 12 percent slopes, eroded; 425 feet west and 400 feet south of the center of sec. 4, T. 20 N., R. 9 W.

Ap—0 to 6 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; mixed with yellowish brown (10YR 5/4) silty clay loam from the subsoil; weak fine granular structure; friable; many very fine and fine roots; slightly acid; abrupt smooth boundary.

Bt1—6 to 12 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; friable; common very fine and fine roots; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thin patchy light yellowish brown (10YR 6/4) silt coatings on faces of peds; strongly acid; clear wavy boundary.

2Bt2—12 to 17 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate medium angular blocky structure; firm; few very fine roots; 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 2 percent gravel; slightly acid; clear wavy boundary.

2Bt3—17 to 22 inches; light olive brown (2.5Y 5/4) silty clay loam; few fine distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common black (10YR 2/1) accumulations of iron and manganese oxide; about 2 percent gravel; neutral; clear wavy boundary.

2BCt—22 to 29 inches; light olive brown (2.5Y 5/4) silty clay loam; few fine distinct light brownish gray (2.5Y 6/2) mottles; weak very coarse subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; common black (10YR 2/1) accumulations of iron and manganese oxide; about 2 percent gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

2Cd—29 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam; few fine distinct gray (5Y 6/1) mottles; massive; very firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 20 to 40 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 silty clay loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The 2Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam, silty clay, or clay loam. The 2BCt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The 2Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. It is silty clay loam or silt loam in which the content of clay is more than 22 percent.

Moundhaven Series

The Moundhaven series consists of deep, somewhat excessively drained, rapidly permeable soils. These soils formed in sandy alluvium on flood plains. Slopes range from 0 to 2 percent.

Moundhaven soils are similar to Chatterton soils and are adjacent to Du Page, Jules, Landes, and Stonelick soils. Chatterton, Du Page, and Landes soils have a surface layer that is darker than that of the Moundhaven soils. Du Page, Jules, Landes, and Stonelick soils have more clay than the Moundhaven soils. They are in the lower positions on the flood plains.

Typical pedon of Moundhaven loamy fine sand, in a cultivated area of Stonelick-Moundhaven complex, frequently flooded; 900 feet east and 1,400 feet north of the southwest corner of sec. 30, T. 21 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loamy fine sand, pale brown (10YR 6/3) dry; weak medium granular structure; very friable; many very fine roots; slight effervescence; mildly alkaline; abrupt wavy boundary.

C1—8 to 18 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium granular structure; very friable; common very fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C2—18 to 24 inches; yellowish brown (10YR 5/4) loamy sand; weak medium granular structure; very friable; common very fine roots; thin strata of dark grayish brown (10YR 4/2) silt loam; slight effervescence; mildly alkaline; clear wavy boundary.

C3—24 to 35 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few very fine roots; slight effervescence; mildly alkaline; abrupt wavy boundary.

C4—35 to 50 inches; yellowish brown (10YR 5/6) sand; single grain; loose; slight effervescence; moderately alkaline; abrupt wavy boundary.

C5—50 to 60 inches; brown (10YR 5/3) sand; single grain; loose; slight effervescence; moderately alkaline.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is loamy sand or sand that has thin strata of sandy loam or silt loam.

Mudlavia Series

The Mudlavia series consists of deep, well drained soils. These soils formed in gravelly outwash on terraces. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 20 percent.

Mudlavia soils are similar to Eldean soils and are adjacent to Boyer, Gosport, Ockley, and Rodman soils. Eldean soils have a solum that is thinner and has a lower content of gravel and cobbles than that of the Mudlavia soils. Boyer and Ockley soils have less clay in the subsoil than the Mudlavia soils and have fewer rock fragments. Boyer soils are on the lower part of side slopes. Ockley soils are in the less sloping positions on the landscape. Gosport soils have fewer rock fragments in the solum than the Mudlavia soils and are underlain by bedrock. Rodman soils have a solum that is thinner and has less clay than that of the Mudlavia soils. Gosport and Rodman soils are on steep breaks.

Typical pedon of Mudlavia cobbly silt loam, 2 to 4 percent slopes, eroded, stony, in a cultivated field; 1,340 feet west and 1,360 feet south of the northeast corner of sec. 28, T. 22 N., R. 7 W.

Ap—0 to 7 inches; dark brown (10YR 3/3) cobbly silt loam, light brownish gray (10YR 6/2) dry; mixed with brown (7.5YR 4/4) extremely gravelly clay from the subsoil; weak medium subangular blocky structure parting to moderate medium granular; friable; many fine and very fine roots; about 15 percent gravel; about 15 percent cobblestones; less than 0.1 percent stones; medium acid; abrupt smooth boundary.

Bt1—7 to 17 inches; brown (7.5YR 4/4) extremely gravelly clay; weak fine subangular blocky structure; friable; many fine and very fine roots; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; about 45 percent gravel; about 20 percent cobblestones; about 5 percent stones; strongly acid; clear wavy boundary.

Bt2—17 to 27 inches; strong brown (7.5YR 4/6) extremely gravelly clay; moderate fine subangular blocky structure; friable; common fine and very fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 50 percent gravel; about 20 percent cobblestones; about 5 percent stones; very strongly acid; clear wavy boundary.

Bt3—27 to 37 inches; strong brown (7.5YR 4/6) extremely gravelly clay; moderate fine subangular blocky structure; friable; common fine and very fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 55 percent gravel; about 20 percent cobblestones; about 5 percent stones; medium acid; clear wavy boundary.

Bt4—37 to 45 inches; brown (7.5YR 4/4) extremely gravelly clay; moderate fine subangular blocky structure; friable; few fine and very fine roots; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; about 50 percent gravel; about 20 percent cobblestones; about 5 percent stones; slightly acid; abrupt wavy boundary.

Bt5—45 to 54 inches; dark brown (7.5YR 3/4) extremely gravelly clay; weak fine subangular blocky structure; friable; few fine and very fine roots; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds; about 55 percent gravel; about 15 percent cobblestones; about 5 percent stones; neutral; clear irregular boundary.

2C—54 to 60 inches; yellowish brown (10YR 5/4) extremely gravelly loamy coarse sand; single grain; loose; about 70 percent gravel; about 20 percent cobblestones; about 5 percent stones; strong effervescence; moderately alkaline.

The solum ranges from 40 to 72 inches in thickness. The Ap horizon has hue of 10YR and value and chroma of 3 or 4. It is cobbly silt loam, cobbly loam, or gravelly silt loam. The content of gravel in this horizon ranges from 15 to 30 percent. The content of cobblestones ranges from 0 to 25 percent. The Bt horizon has hue of 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is extremely gravelly clay loam, extremely gravelly clay, or extremely cobbly clay. The content of gravel in this horizon ranges from 35 to 60 percent. The content of cobblestones ranges from 15 to 35 percent. The content of stones ranges from 1 to 15 percent. The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is very gravelly coarse sand, very gravelly loamy coarse sand, extremely gravelly coarse sand, or extremely gravelly loamy coarse sand. The content of gravel in this horizon ranges from 35 to 80 percent. The content of cobblestones ranges from 15 to 25 percent. The content of stones ranges from 1 to 15 percent.

Ockley Series

The Ockley series consists of deep, well drained soils. These soils formed in silty and loamy sediments and gravelly outwash on terraces. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 6 percent.

Ockley soils are similar to Eldean, Martinsville, and Rush soils and are adjacent to Mudlavia and Rodman soils. Eldean soils have more clay in the subsoil than the Ockley soils and have a thinner solum. Martinsville soils have less gravel in the lower part of the solum than the Ockley soils, and Rush soils have more silt and less sand in the upper part of the subsoil. Mudlavia soils have more clay in the subsoil than the Ockley soils and have more rock fragments. They are in the more sloping positions on the landscape. Rodman soils have a solum that is thinner than that of the Ockley soils. They are on steep breaks.

Typical pedon of Ockley silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,400 feet east and 100 feet north of the center of sec. 31, T. 21 N., R. 8 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/4) silty clay loam from the subsoil; moderate medium granular structure; friable; few fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; about 1 percent gravel; medium acid; clear wavy boundary.

2Bt2—15 to 31 inches; brown (7.5YR 5/4) clay loam; moderate fine subangular blocky structure; friable; few fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; about 10 percent gravel; strongly acid; clear wavy boundary.

3Bt3—31 to 47 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 20 percent gravel; medium acid; gradual wavy boundary.

3Bt4—47 to 60 inches; dark brown (7.5YR 3/4) gravelly sandy clay loam; weak coarse subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; about 20 percent gravel; slightly acid; abrupt irregular boundary.

4C—60 to 80 inches; pale brown (10YR 6/3) gravelly coarse sand; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 72 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 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 to 6. It is silty clay loam or silt loam. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or sandy clay loam. The content of gravel in this horizon ranges from 0 to 10 percent. The 3Bt horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 3 to 6. It is gravelly clay loam or gravelly sandy clay loam. The content of gravel in this horizon ranges from 15 to 35 percent. The 4C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is gravelly coarse sand or gravelly loamy coarse sand. A sandy substratum phase of this series is mapped in the county.

Ormas Series

The Ormas series consists of deep, well drained soils. These soils formed in sandy, loamy, and gravelly outwash on terraces. Permeability is rapid in the upper part of the solum, moderately rapid in the lower part of the solum, and very rapid in the underlying material. Slopes range from 1 to 4 percent.

Ormas soils are similar to Oshtemo soils and are adjacent to Boyer, Chatterton, Du Page, and Landes soils. Boyer and Oshtemo soils have more clay in the upper part of the solum than the Ormas soils. Boyer soils are on the higher lying terraces. Chatterton and Landes soils have less gravel than the Ormas soils. Du Page soils have more clay in the upper part of the solum than the Ormas soils and have a darker surface layer. Chatterton, Du Page, and Landes soils are in the lower lying positions on flood plains, at the base of slopes.

Typical pedon of Ormas loamy sand, 1 to 4 percent slopes, in a cultivated field; 2,250 feet west and 50 feet south of the northeast corner of sec. 4, T. 22 N., R. 8 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many very fine roots; slightly acid; abrupt smooth boundary.

E1—7 to 18 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine granular structure; very friable; common very fine roots; slightly acid; gradual wavy boundary.

E2—18 to 37 inches; yellowish brown (10YR 5/4) loamy sand; weak fine granular structure; very friable; few very fine roots; slightly acid; clear wavy boundary.

2Bt1—37 to 45 inches; brown (7.5YR 4/4) gravelly coarse sandy loam; weak coarse subangular blocky structure; very friable; clay bridging between sand grains; about 20 percent gravel; medium acid; clear wavy boundary.

2Bt2—45 to 72 inches; strong brown (7.5YR 4/6) gravelly sandy clay loam; weak coarse subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 20 percent gravel; neutral; clear irregular boundary.

3C—72 to 80 inches; dark yellowish brown (10YR 4/4) very gravelly coarse sand; single grain; loose; about 40 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 60 to 75 inches. The Ap and E horizons have hue of 10YR, value of 3 to 6, and chroma of 2 to 4. They are loamy sand, loamy fine sand, or sand. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. The content of gravel in this horizon is 15 to 30 percent. The 3C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is gravelly coarse sand or very gravelly coarse sand.

Oshtemo Series

The Oshtemo series consists of deep, well drained soils. These soils formed in loamy and sandy outwash on terraces. Permeability is moderately rapid in the solum and very rapid in the underlying material. Slopes range from 0 to 6 percent.

Oshtemo soils are similar to Carmi, Elston, and Ormas soils and are adjacent to Boyer, Chatterton, and Landes soils. Carmi and Elston soils have a surface layer that is darker than that of the Oshtemo soils, and Ormas soils have less clay in the upper part of the solum. Boyer soils have a solum that is thinner than that of the Oshtemo soils. They are on steep breaks. Chatterton and Landes soils have less gravel than the Oshtemo soils. They are in the lower lying positions on flood plains, at the base of slopes.

Typical pedon of Oshtemo coarse sandy loam, 2 to 6 percent slopes, in a cultivated field; 1,800 feet west and 100 feet north of the southeast corner of sec. 16, T. 21 N., R. 8 W.

Ap1—0 to 6 inches; dark brown (10YR 4/3) coarse sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

Ap2—6 to 10 inches; brown (10YR 4/3) coarse sandy loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure parting to weak fine granular; friable; many fine and very fine roots; about 1 percent gravel; medium acid; abrupt smooth boundary.

Bt1—10 to 20 inches; dark yellowish brown (10YR 3/4) coarse sandy loam; weak medium subangular blocky structure; friable; common very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds and clay bridges between sand grains; about 2 percent gravel; slightly acid; gradual wavy boundary.

Bt2—20 to 33 inches; dark brown (7.5YR 3/4) coarse sandy loam; weak coarse subangular blocky structure; friable; few very fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds and clay bridges between sand grains; about 3 percent gravel; slightly acid; gradual wavy boundary.

Bt3—33 to 41 inches; dark brown (7.5YR 3/4) coarse sandy loam; weak very coarse subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds and clay bridges between sand grains; about 3 percent gravel; slightly acid; gradual wavy boundary.

BCt—41 to 50 inches; dark yellowish brown (10YR 3/4) loamy coarse sand; weak very coarse subangular blocky structure; very friable; dark yellowish brown (10YR 3/4) clay bridges between sand grains; about 3 percent gravel; slightly acid; gradual wavy boundary.

BC—50 to 58 inches; dark yellowish brown (10YR 3/4) coarse sand; single grain; loose; about 4 percent gravel; slightly acid; abrupt irregular boundary.

2C—58 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; thin lenses of dark yellowish brown (10YR 3/4) loamy coarse sand; about 25 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is coarse sandy loam or sandy loam. The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. It is sandy loam, coarse sandy loam, or sandy clay loam. The content of gravel ranges from 1 to 15 percent in the Bt, BCt, and BC horizons. The BCt and BC horizons have hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. They are loamy sand, loamy coarse sand, or coarse sand. The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is gravelly sand or gravelly coarse sand. The content of gravel in this horizon ranges from 15 to 30 percent.

Peotone Series

The Peotone series consists of deep, very poorly drained, moderately slowly permeable soils. These soils formed in local colluvium in potholes on ground moraines and end moraines. Slopes range from 0 to 2 percent.

Peotone soils are similar to Milford soils and are adjacent to Barce, Drummer, Houghton, Strawn, Wallkill Variant, Warners Variant, and Washtenaw soils. Milford soils have a surface layer that is thinner than that of the Peotone soils. Barce and Strawn soils are browner than the Peotone soils and have less clay in the subsoil. They are in the more sloping areas. Drummer soils have a surface layer that is thinner than that of the Peotone soils and have less clay in the subsoil. They are in the slightly higher lying areas. Houghton soils formed in organic deposits. They are in the slightly lower lying areas. Wallkill Variant soils formed in mineral material less than 40 inches deep over organic deposits. Warners Variant and Washtenaw soils have less clay in the subsoil than the Peotone soils. They are in the less concave areas.

Typical pedon of Peotone silty clay loam, pothole, in a cultivated field; 120 feet west and 1,600 feet south of the northeast corner of sec. 2, T. 22 N., R. 9 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

A1—10 to 21 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; many very fine roots; slightly acid; gradual wavy boundary.

A2—21 to 32 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; firm; common very fine roots; slightly acid; clear wavy boundary.

Bg1—32 to 39 inches; gray (10YR 5/1) silty clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; few very fine roots; many black (10YR 2/1) krotovinas; neutral; clear smooth boundary.

Bg2—39 to 47 inches; light brownish gray (10YR 6/2) silty clay; many medium faint gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; many black (10YR 2/1) clay krotovinas; neutral; gradual wavy boundary.

BCg—47 to 52 inches; light gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; common black (10YR 2/1) krotovinas; neutral; gradual wavy boundary.

Cg—52 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; common very dark brown (10YR 2/2) krotovinas; slight effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The mollic epipedon is 24 to 36 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1, or it is neutral in hue. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2, or it is neutral in hue. The BCg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1, or it is neutral in hue. It is silt loam or silty clay loam. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2, or it is neutral in hue. It is dominantly silty clay loam, but in some pedons it is silt loam.

Piankeshaw Variant

The Piankeshaw Variant consists of deep, well drained, moderately rapidly permeable soils. These soils formed in loamy alluvium on flood plains. Slopes range from 0 to 2 percent.

Piankeshaw Variant soils are adjacent to Beaucoup, Gosport, and High Gap Variant soils. Beaucoup soils have less sand and gravel than the Piankeshaw Variant soils and have a grayer subsoil. They are in depressional areas. Gosport and High Gap Variant soils have more clay and fewer rock fragments than the Piankeshaw Variant soils. They are underlain by bedrock. They are on steep breaks.

Typical pedon of Piankeshaw Variant gravelly silt loam, rarely flooded, in a wooded area; 1,100 feet east and 200 feet north of the southwest corner of sec. 20, T. 21 N., R. 8 W.

A1—0 to 7 inches; dark brown (10YR 3/3) gravelly silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine and medium roots; about 25 percent gravel; about 7 percent cobbles; slight effervescence; moderately alkaline; clear wavy boundary.

A2—7 to 28 inches; dark brown (10YR 3/3) extremely gravelly loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine and medium roots; about 40 percent gravel; about 25 percent cobbles; about 0.5 percent stones; slight effervescence; moderately alkaline; clear wavy boundary.

A3—28 to 45 inches; dark brown (10YR 3/3) extremely gravelly loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common fine and medium roots; about 60 percent gravel; about 25 percent cobbles; about 5 percent stones; slight effervescence; moderately alkaline; gradual wavy boundary.

C—45 to 60 inches; dark yellowish brown (10YR 4/4) extremely gravelly sandy loam; weak medium granular structure; very friable; common fine and medium roots; about 65 percent gravel; about 20 percent cobbles; about 3 percent stones; thin strata of gravelly loamy sand; slight effervescence; moderately alkaline.

The content of rock fragments increases with increasing depth. It ranges from 20 to 90 percent in the A horizon and from 35 to 90 percent in the C horizon. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

Proctor Series

The Proctor series consists of deep, moderately well drained soils. These soils formed in silty deposits and loamy outwash on ground moraines. Permeability generally is moderate in the upper part of the solum and moderate or moderately rapid in the lower part and in the underlying material. In the till substratum phase, however, it is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 0 to 6 percent.

Proctor soils are similar to Waupecan soils and are adjacent to Brenton, Drummer, and Millbrook soils. Waupecan soils have more gravel in the lower part of the subsoil and in the underlying material than the Proctor soils. Brenton, Drummer, and Millbrook soils are grayer in the subsoil than the Proctor soils. Brenton and Millbrook soils are in the lower positions on the landscape. Drummer soils are in depressions.

Typical pedon of Proctor silt loam, 0 to 2 percent slopes, in a cultivated field; 1,200 feet west and 1,240 feet south of the northeast corner of sec. 19, T. 22 N., R. 9 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; many fine and very fine roots; slightly acid; abrupt smooth boundary.

A—8 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; many very fine and fine roots; slightly acid; clear wavy boundary.

Bt1—11 to 26 inches; dark brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; common very fine roots; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—26 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; few very fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear wavy boundary.

2Bt3—35 to 48 inches; yellowish brown (10YR 5/4) loam; many medium distinct grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 3 percent gravel; slightly acid; clear wavy boundary.

2BC—48 to 53 inches; yellowish brown (10YR 5/6) loam that has thin strata of sandy loam and loamy fine sand; many medium distinct light brownish gray (2.5Y 6/2) and many medium faint brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; friable; about 4 percent gravel; neutral; gradual wavy boundary.

2C—53 to 60 inches; yellowish brown (10YR 5/4) sandy loam that has thin strata of loamy sand and fine sand; massive; friable; about 4 percent gravel; slight effervescence; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. The silty material is 24 to 40 inches thick. The depth to free carbonates is more than 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The Bt horizon has hue of 7.5YR or 10YR and value and chroma of 3 to 6. 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, loam, or silty clay loam in which the content of sand is more than 15 percent. The 2C horizon has hue of 2.5Y, 7.5YR, or 10YR, value of 4 to 6, and chroma of 2 to 6. It is sandy loam or loam that has thin strata of sandy material. A till substratum phase of this series is mapped in the county.

Ragsdale Series

The Ragsdale series consists of deep, very poorly drained, moderately permeable soils. These soils formed in loess on ground moraines. Slopes range from 0 to 2 percent.

The Ragsdale soils in this county have less of a clay increase in the upper part of the subsoil than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Ragsdale soils are similar to Drummer and Sable soils and are adjacent to Iona and Reesville soils. Drummer soils have more sand in the lower part of the subsoil and in the underlying material than the Ragsdale soils. Sable soils have slightly more clay in the subsoil than the Ragsdale soils. Iona and Reesville soils have a surface layer that is thinner and lighter colored than that of the Ragsdale soils and have a browner subsoil. They are on rises.

Typical pedon of Ragsdale silt loam, in a cultivated field; 150 feet east and 2,200 feet north of the southwest corner of sec. 20, T. 20 N., R. 9 W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.

A—8 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to moderate medium granular; firm; few very fine roots; neutral; clear wavy boundary.

Btg1—14 to 23 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct olive yellow (2.5Y 6/6) mottles; moderate medium subangular blocky structure; firm; few very fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; many very dark gray (10YR 3/1) organic coatings on faces of peds; many very dark gray (10YR 3/1) krotovinas and root channels; neutral; gradual wavy boundary.

Btg2—23 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/8) and common fine distinct olive yellow (2.5Y 6/6) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; common very dark gray (10YR 3/1) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas and root channels; neutral; clear wavy boundary.

Btg3—31 to 39 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine faint light yellowish brown (2.5Y 6/4) and common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure; firm; thin discontinuous grayish brown (2.5Y 5/2) clay films on faces of prisms; common very dark gray (10YR 3/1) organic coatings on faces of prisms; common very dark gray (10YR 3/1) krotovinas and root channels; neutral; gradual wavy boundary.

BCtg—39 to 48 inches; light brownish gray (2.5Y 6/2) silt loam; many medium distinct yellowish brown (10YR 5/8) and common fine distinct olive yellow (2.5Y 6/6) mottles; weak coarse subangular blocky structure; firm; thin patchy grayish brown (2.5Y 5/2) clay films on faces of peds; few very dark gray (10YR 3/1) organic coatings on faces of peds; few very dark gray (10YR 3/1) krotovinas; mildly alkaline; gradual wavy boundary.

Cg—48 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct yellowish brown (10YR 5/8) and many fine distinct olive yellow (2.5Y 6/6) mottles; massive; friable; slight effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y. It has value of 3 to 6 and chroma of 1 or 2 in the upper part and value of 4 to 6 and chroma of 2 to 6 in the lower part. It is silty clay loam or silt loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6.

Rainsville Series

The Rainsville series consists of deep, moderately well drained soils. These soils formed in silty sediments, loamy outwash, and glacial till on ground moraines and end moraines. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 12 percent.

Rainsville soils are similar to Rockfield and Williamstown soils and are adjacent to Cyclone, Hennepin, Miami, Rockfield, and Williamstown soils. Rockfield and Williamstown soils are in positions on the landscape similar to those of the Rainsville soils. Rockfield soils have more silt and less sand in the upper part of the subsoil than the Rainsville soils, and Williamstown soils have a thinner solum. Cyclone soils have a subsoil that is grayer than that of the Rainsville soils and have less sand in the solum. They are in depressional areas. Hennepin and Miami soils have a solum that is thinner than that of the Rainsville soils. Hennepin soils are on steep breaks. Miami soils are in the more sloping positions on the landscape.

Typical pedon of Rainsville silt loam, in a cultivated area of Rainsville-Williamstown-Rockfield silt loams, 2 to 6 percent slopes, eroded; 400 feet west and 1,280 feet south of the northeast corner of sec. 6, T. 21 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; mixed with dark yellowish brown (10YR 4/4) silt loam from the subsoil; moderate fine subangular blocky structure parting to moderate fine granular; friable; common fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common fine and very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; common dark grayish brown (10YR 4/2) earthworm channels; slightly acid; clear wavy boundary.

2Bt2—13 to 21 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; few fine and very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few dark grayish brown (10YR 4/2) earthworm channels; about 5 percent gravel; very strongly acid; clear wavy boundary.

2Bt3—21 to 30 inches; dark brown (7.5YR 4/4) loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds and within pores; about 5 percent gravel; very strongly acid; gradual wavy boundary.

2Bt4—30 to 42 inches; strong brown (7.5YR 4/6) loam; few fine distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds and within pores; about 8 percent gravel; strongly acid; abrupt irregular boundary.

3Bt5—42 to 48 inches; olive brown (2.5Y 4/4) loam; few fine distinct brownish yellow (10YR 6/6) and grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films on faces of peds and within pores; about 4 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

3Cd—48 to 60 inches; light olive brown (2.5Y 5/4) loam; common medium distinct light brownish gray (2.5Y 6/2) and common fine distinct light yellowish brown

(10YR 6/4) mottles; massive; firm; about 9 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 45 to 60 inches. Depth to the 3Bt horizon ranges from 40 to 50 inches. The A horizon has hue of 10YR, value of 4, and chroma of 2 to 4. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. The content of gravel in this horizon is 0 to 2 percent. The 2Bt horizon has hue of 10YR and value and chroma 4 to 6 in the upper part and hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6 in the lower part. It is clay loam, loam, or sandy clay loam. The content of gravel is 1 to 5 percent in the upper part of this horizon and 5 to 15 percent in the lower part. It ranges from 2 to 10 percent in the 3Bt and 3Cd horizons. The 3Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. The 3Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Reesville Series

The Reesville series consists of deep, somewhat poorly drained, moderately permeable soils. These soils formed in loess on ground moraines. Slopes range from 0 to 2 percent.

Reesville soils are similar to Starks soils and are adjacent to Alford, Iona, and Ragsdale soils. Starks soils have less silt and more sand in the lower part of the subsoil and in the underlying material than the Reesville soils. Alford and Iona soils are browner in the subsoil than the Reesville soils. They are in the higher lying positions on the landscape. Ragsdale soils have a surface layer that is thicker and darker than that of the Reesville soils and have a grayer subsoil. They are in depressional areas.

Typical pedon of Reesville silt loam, 0 to 2 percent slopes, in a cultivated field; 150 feet east and 1,850 feet south of the northwest corner of sec. 32, T. 20 N., R. 9 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak fine granular structure; friable; many fine and very fine roots; medium acid; abrupt smooth boundary.

Bt1—8 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; firm; common very fine roots; thin continuous 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; common dark grayish brown (10YR 4/2) krotovinas and root channels; very strongly acid; clear wavy boundary.

Bt2—16 to 27 inches; light yellowish brown (2.5Y 6/4) silt loam; common medium faint light brownish gray (2.5Y 6/2) and common fine prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common dark grayish brown (10YR 4/2) krotovinas and root channels; slightly acid; gradual wavy boundary.

Bt3—27 to 33 inches; light yellowish brown (2.5Y 6/4) silt loam; common fine faint grayish brown (2.5Y 5/2) and common fine distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; few dark gray (10YR 4/1) krotovinas and root channels; neutral; gradual wavy boundary.

BC—33 to 42 inches; olive yellow (2.5Y 6/6) silt loam; common fine distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; weak very coarse subangular blocky structure; friable; common very dark gray (10YR 3/1) accumulations of iron and manganese oxide; few white (10YR 8/2) accumulations of calcium carbonate; slight effervescence; moderately alkaline; gradual wavy boundary.

C1—42 to 53 inches; olive yellow (2.5Y 6/6) silt loam; common medium distinct yellowish brown (10YR 5/8) and common fine distinct light brownish gray (2.5Y 6/2) mottles; massive; friable; few very dark gray (10YR 3/1) accumulations of iron and manganese oxide; few white (10YR 8/2) accumulations of calcium carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—53 to 60 inches; olive yellow (2.5Y 6/6) silt loam; common fine distinct yellowish brown (10YR 5/8) mottles; massive; firm; few white (10YR 8/2) accumulations of calcium carbonate; strong effervescence; moderately alkaline.

The solum is 40 to 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 to 6, and chroma of 2 to 4. The BC horizon has hue of 2.5Y, value of 5 or 6, and chroma of 4 to 6. The C horizon has hue of 2.5Y, value of 5 or 6, and chroma of 6.

Rockfield Series

The Rockfield series consists of deep, moderately well drained soils. These soils formed in silty sediments, loamy outwash, and glacial till on terraces and moraines. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 6 percent.

Rockfield soils are similar to Rainsville and Williamstown soils and are adjacent to Cyclone, Miami, Millbrook, Rainsville, and Williamstown soils. Rainsville and Williamstown soils have less silt and more sand in the upper part of the subsoil than the Rockfield soils. Also, Williamstown soils have a thinner solum. Cyclone and Millbrook soils are grayer in the subsoil than the Rockfield soils. Cyclone soils are in depressional areas. Millbrook soils are in the less sloping positions on the landscape. Miami soils have a solum that is thinner than that of the Rockfield soils. They are in the more sloping areas.

Typical pedon of Rockfield silt loam, 0 to 2 percent slopes, in a cultivated field; 800 feet east and 50 feet north of the southwest corner of sec. 21, T. 23 N., R. 6 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; common very fine and fine roots; slightly acid; abrupt smooth boundary.

BE—10 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; thin continuous brown (10YR 4/3) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—13 to 31 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; friable; few fine and very fine roots; thin continuous yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; gradual wavy boundary.

2Bt2—31 to 36 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark yellowish brown (10YR 4/6) clay films on faces of peds; about 3 percent gravel; strongly acid; clear wavy boundary.

2Bt3—36 to 45 inches; yellowish brown (10YR 5/4) loam; common fine faint light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/6) clay films on faces of peds; about 3 percent gravel; medium acid; clear wavy boundary.

2Bt4—45 to 50 inches; yellowish brown (10YR 5/4) loam; few fine distinct light brownish gray (10YR 6/2) and common fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

3Bt5—50 to 56 inches; light yellowish brown (10YR 6/4) loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 7 percent gravel; slight effervescence; moderately alkaline; clear wavy boundary.

3Cd—56 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; firm; about 6 percent gravel; strong effervescence; moderately alkaline.

The solum ranges from 50 to 60 inches in thickness. The silty material is 24 to 40 inches thick. Depth to the 3Bt horizon ranges from 45 to 55 inches. The Ap horizon has hue of 10YR, value of 4, and chroma 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. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam, clay loam, or sandy clay loam. The content of gravel in this horizon ranges from 0 to 10 percent. The 3Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. The 3Cd horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 3 or 4.

Rodman Series

The Rodman series consists of deep, excessively drained soils. These soils formed in gravelly outwash on terrace breaks. Permeability is moderately rapid in the solum and very rapid in the underlying material. Slopes range from 25 to 60 percent.

Rodman soils are adjacent to Armiesburg Variant, Boyer, Comfrey, Eldean, Mudlavia, Ockley, and Rush soils. Armiesburg Variant soils have less sand and gravel than the Rodman soils, and the rest of the adjacent soils have a thicker solum. Also, Comfrey soils are grayer in the subsoil, and Eldean and Mudlavia soils have more clay in the solum. Armiesburg Variant and Comfrey soils are in the lower lying positions on flood plains, adjacent to the base of slopes. Boyer soils are on the less sloping breaks.

Typical pedon of Rodman gravelly loam, 25 to 60 percent slopes, in a wooded area; 2,500 feet west and 1,000 feet south of the northeast corner of sec. 29, T. 21 N., R. 8 W.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many medium and coarse roots; about 20 percent gravel; neutral; clear smooth boundary.

Bw—6 to 15 inches; brown (10YR 5/3) gravelly loam; weak fine granular structure; friable; many medium and coarse roots; about 25 percent gravel; neutral; abrupt smooth boundary.

C—15 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; few coarse roots; about 45 percent gravel; strong effervescence; moderately alkaline.

The solum ranges from 10 to 15 inches in thickness. It is loam, gravelly loam, or gravelly sandy loam. The content of gravel ranges from 10 to 25 percent in the solum and from 35 to 60 percent in the C horizon. The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is very gravelly sand or very gravelly coarse sand.

Rush Series

The Rush series consists of deep, well drained soils. These soils formed in silty sediments and loamy and gravelly outwash on terraces. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 6 percent.

Rush soils are similar to Camden, Ockley, and Waupecan soils and are adjacent to Rodman and Starks soils. Camden soils have less gravel in the lower part of the subsoil and in the underlying material than the Rush soils, Ockley soils have more sand and less silt in the upper part of the subsoil, and Waupecan soils have a darker surface layer. Rodman soils have a solum that is thinner than that of the Rush soils. They are on steep breaks. Starks soils are grayer in the subsoil than the Rush soils. They are in the lower positions on the landscape.

Typical pedon of Rush silt loam, 0 to 2 percent slopes, in a cultivated field; 1,510 feet west and 350 feet south of the northeast corner of sec. 16, T. 22 N., R. 8 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—10 to 17 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—17 to 37 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual wavy boundary.

2Bt3—37 to 46 inches; brown (7.5YR 5/4) loam; moderate medium subangular blocky structure; friable; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

2Bt4—46 to 54 inches; brown (7.5YR 5/4) sandy clay loam; moderate coarse subangular blocky structure; friable; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

3Bt5—54 to 60 inches; dark brown (7.5YR 3/4) gravelly sandy loam; moderate medium subangular blocky structure; friable; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds; about 20 percent gravel; slight effervescence; mildly alkaline; clear irregular boundary.

3C—60 to 80 inches; yellowish brown (10YR 5/4) gravelly loamy coarse sand; single grain; loose; about 35 percent gravel; strong effervescence; moderately alkaline.

The solum is 55 to 80 inches thick. The silty deposits are 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 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 3 or 4. It is loam, clay loam, or sandy clay loam. The 3Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 3 or 4. It is gravelly sandy clay loam, gravelly sandy loam, or gravelly loam. The content of gravel in this horizon ranges from 15 to 30 percent. The 3C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is gravelly or very gravelly coarse sand or gravelly or very gravelly loamy coarse sand. The content of gravel in this horizon ranges from 25 to 50 percent.

Sable Series

The Sable series consists of deep, poorly drained, moderately permeable soils. These soils formed in loess on ground moraines. Slopes range from 0 to 2 percent.

Sable soils are similar to Cyclone, Drummer, and Ragsdale soils and are adjacent to Ipava soils. Cyclone and Drummer soils have more sand in the lower part of the subsoil and in the underlying material than the Sable soils. Ragsdale soils have slightly less clay in the subsoil than the Sable soils. Ipava soils have a subsoil that is more clayey and browner than that of the Sable soils. They are in the slightly higher positions on the landscape.

Typical pedon of Sable silty clay loam, in a cultivated field; 700 feet west and 2,450 feet south of the northeast corner of sec. 31, T. 20 N., R. 10 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few very fine roots; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium angular blocky structure; firm; few very fine roots; neutral; abrupt wavy boundary.

Bg—13 to 19 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct dark grayish brown (2.5Y 4/2) mottles; moderate fine angular blocky structure; firm; few very fine roots; many black (N 2/0) organic coatings on faces of peds; many black (N 2/0) krotovinas and root channels; mildly alkaline; clear wavy boundary.

Btg1—19 to 24 inches; dark grayish brown (2.5Y 4/2) silty clay loam; many fine distinct light yellowish brown (2.5Y 6/4) and common fine distinct olive yellow (2.5Y 6/8) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; common black (10YR 2/1) krotovinas and root channels; mildly alkaline; clear wavy boundary.

Btg2—24 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium distinct light yellowish brown (2.5Y 6/4) and common fine distinct yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of prisms; common black (10YR 2/1) krotovinas and root channels; mildly alkaline; clear wavy boundary.

Btg3—30 to 45 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/8) and many fine distinct light yellowish brown (2.5Y 6/4) mottles; weak very thick prismatic structure; friable; thin patchy dark gray (10YR 4/1) clay films on faces of prisms; few dark gray (10YR 4/1) accumulations of iron and manganese oxide; few dark gray (10YR 4/1) krotovinas; mildly alkaline; gradual wavy boundary.

Cg1—45 to 51 inches; light brownish gray (2.5Y 6/2) silt loam; many medium faint light yellowish brown (2.5Y 6/4) and common fine distinct yellowish brown (10YR 5/8) mottles; massive; friable; few dark gray (10YR 4/1) krotovinas; slight effervescence; moderately alkaline; gradual wavy boundary.

Cg2—51 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; many medium faint light yellowish brown (2.5Y 6/4) and common fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 35 to 60 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1, or it is neutral in hue. The B horizon generally has hue of 10YR or 2.5Y and has value of 3 to 6 and chroma of 1 or 2 in the upper part and value of 4 to 6 and chroma of 1 to 4 in the lower part. In some pedons it is neutral in hue and has value of 3 to 6 in the upper part and value of 4 to 6 in the lower part. This horizon is silty clay loam in the upper part and silty clay loam or silt loam in the lower part. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4.

Shadeland Variant

The Shadeland Variant consists of moderately deep, somewhat poorly drained soils. These soils formed in silty sediments and glacial drift over shale residuum. They are on bedrock terraces. Permeability is moderately slow in the solum and moderately slow or slow in the underlying material. Slopes range from 0 to 2 percent.

Shadeland Variant soils are adjacent to Gosport, High Gap, High Gap Variant, and Weikert Variant soils. All of the adjacent soils are browner in the subsoil than the Shadeland Variant soils. Also, High Gap, High Gap Variant, and Weikert Variant soils have less clay in the subsoil. High Gap and High Gap Variant soils are in the more sloping positions on the landscape. Gosport and Weikert Variant soils are on steep breaks.

Typical pedon of Shadeland Variant silt loam, 0 to 2 percent slopes, in a cultivated field; 1,300 feet west and 400 feet south of the center of sec. 9, T. 22 N., R. 6 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; strongly acid; abrupt smooth boundary.

E—7 to 10 inches; grayish brown (10YR 5/2) silt loam; moderate medium platy structure parting to moderate medium granular; friable; common fine and very fine roots; common dark yellowish brown (10YR 4/4) iron and manganese stains; strongly acid; clear wavy boundary.

Bt1—10 to 13 inches; yellowish brown (10YR 5/6) silty clay; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 1 percent gravel; very strongly acid; clear wavy boundary.

Bt2—13 to 21 inches; yellowish brown (10YR 5/6) clay; many fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 8 percent gravel; very strongly acid; clear wavy boundary.

Bt3—21 to 29 inches; light olive brown (2.5Y 5/4) clay loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 1 percent gravel; slightly acid; clear wavy boundary.

2C—29 to 34 inches; light brownish gray (2.5Y 6/2) shaly silty clay; many fine faint light gray (N 6/0) and common fine distinct olive yellow (2.5Y 6/8) mottles; massive; firm; about 25 percent shale fragments; very strongly acid; gradual wavy boundary.

2Cr—34 inches; dark gray (10YR 4/1) partly weathered, thinly bedded shale that grades into unweathered shale at 37 inches; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of shale fragments ranges from 0 to 5 percent throughout the solum. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The E horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 8. The 2C horizon has colors similar to those of the Bt horizon.

Starks Series

The Starks series consists of deep, somewhat poorly drained soils. These soils formed in silty sediments and loamy outwash on ground moraines. Permeability is moderate in the upper part of the profile and moderately slow in the lower part of the underlying material. Slopes range from 0 to 2 percent.

Starks soils are similar to Millbrook and Reesville soils and are adjacent to Camden, Cyclone, Martinsville, Rush, and Tuscola soils. Millbrook soils have a surface layer that is darker than that of the Starks soils, and Reesville soils have more silt and less sand in the lower part of the subsoil and in the underlying material. Cyclone soils have a subsoil that is grayer than that of the Starks soils. They are in the slightly lower depressions. Camden, Martinsville, Rush, and Tuscola soils are in the slightly higher or more sloping positions on the landscape. They are browner in the subsoil than the Starks soils. Martinsville and Tuscola soils have sand in the solum.

Typical pedon of Starks silt loam, till substratum, 0 to 2 percent slopes, in a cultivated field; 700 feet east and 1,300 feet north of the southwest corner of sec. 11, T. 22 N., R. 7 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure parting to weak medium granular; friable; common very fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 12 inches; brown (10YR 5/3) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; common very fine roots; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—12 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few very fine roots; thin continuous light brownish gray (10YR 6/2) clay films on faces of peds; medium acid; clear wavy boundary.

2Bt3—30 to 50 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; about 5 percent gravel; medium acid; clear wavy boundary.

2C—50 to 56 inches; yellowish brown (10YR 5/4) sandy loam that has thin strata of loamy sand, silt loam, and loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; massive; friable; about 5 percent gravel; neutral; abrupt irregular boundary.

3Cd—56 to 60 inches; light olive brown (2.5Y 5/4) loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; massive; firm; about 7 percent gravel; slight effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The silty deposits are 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 2 to 4. The 2Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The 2C horizon has colors similar to those of the 2Bt horizon. It is sandy loam, loam, or silt loam and has sandy strata. The 3Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Stonelick Series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils. These soils formed in loamy alluvium on flood plains. Slopes range from 0 to 2 percent.

Stonelick soils are similar to Landes soils and are adjacent to Armiesburg Variant, Beckville, Chatterton, Du Page, Hennepin, Jules, and Moundhaven soils. Landes, Armiesburg Variant, Chatterton, and Du Page soils have a surface layer that is darker than that of the Stonelick soils. Armiesburg Variant, Du Page, and Hennepin soils have more clay than the Stonelick soils, Beckville soils are grayer, Chatterton and Moundhaven soils have less clay, and Jules soils have more silt and less sand. Armiesburg Variant, Beckville, Chatterton, Du Page, and Jules soils are in the slightly lower lying areas. Moundhaven soils are in the slightly higher positions on the landscape. Hennepin soils are on steep breaks.

Typical pedon of Stonelick loam, in a cultivated area of Stonelick-Moundhaven complex, frequently flooded; 440 feet east and 460 feet south of the northwest corner of sec. 23, T. 21 N., R. 8 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; very friable; many fine and very fine roots; few light gray (10YR 7/1) shell fragments; strong effervescence; moderately alkaline; abrupt smooth boundary.

C1—9 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam; massive; very friable; common fine and very fine roots; thin lens of brown (10YR 5/3) fine sand; few light gray (10YR 7/1) shell fragments; strong effervescence; mildly alkaline; clear wavy boundary.

C2—15 to 24 inches; dark grayish brown (10YR 4/2) loam; massive; friable; few very fine roots; few light gray (10YR 7/1) shell fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—24 to 33 inches; dark brown (10YR 4/3) fine sandy loam; massive; very friable; few very fine roots; thin lens of brown (10YR 5/3) very fine sand; few white (10YR 8/1) shell fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C4—33 to 40 inches; brown (10YR 4/3) fine sandy loam; massive; very friable; few small pockets of brown (10YR 5/3) loamy fine sand; few white (10YR 8/1) shell fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C5—40 to 60 inches; brown (10YR 4/3) fine sandy loam; massive; very friable; few small pockets and lenses of brown (10YR 5/3) loamy fine sand; few white (10YR 8/1) shell fragments; strong effervescence; moderately alkaline.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. It is fine sandy loam, sandy loam, loam, or silt loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is fine sandy loam, loam, or sandy loam that has thin layers of loamy fine sand, very fine sand, or fine sand.

Strawn Series

The Strawn series consists of deep, well drained soils. These soils formed in glacial till on end moraines. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 12 percent.

Strawn soils are similar to Miami soils and are adjacent to Peotone, Washtenaw, and Williamstown soils. Miami and Williamstown soils have a solum that is thicker than that of the Strawn soils. Peotone and Washtenaw soils are in depressional areas. They are grayer than the Strawn soils. Also, Peotone soils have more clay, and Washtenaw soils have less sand. Williamstown soils have gray mottles in the lower part of the subsoil. They are in the less sloping positions on the landscape.

Typical pedon of Strawn clay loam, 6 to 12 percent slopes, severely eroded, in a cultivated field; 200 feet west and 1,540 feet north of the southeast corner of sec. 7, T. 22 N., R. 8 W.

Ap—0 to 7 inches; brown (10YR 4/3) clay loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/4) material from the subsoil; weak medium granular structure; friable; many very fine and fine roots; about 3 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—7 to 13 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; many very fine and fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

Bt2—13 to 20 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; common very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 3 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

Cd—20 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; firm; few very fine roots; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 10 to 27 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6.

Symerton Series

The Symerton series consists of deep, moderately well drained soils. These soils formed in silty deposits, loamy outwash, and glacial till on end moraines and ground moraines. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 1 to 6 percent.

Symerton soils are similar to Barce soils and are adjacent to Drummer, Markham, Varna, and Williamsport soils. Barce soils have less clay in the lower part of the subsoil and in the underlying material than the Symerton soils. Markham and Varna soils are in positions on the landscape similar to those of the Symerton soils. They have more clay in the upper part of the subsoil than the Symerton soils. Also, Markham soils have a thinner surface layer. Drummer and Williamsport soils are grayer in the subsoil than the Symerton soils. Also, Williamsport soils have more clay in the subsoil. They are in the less sloping positions on the landscape. Drummer soils are in depressional areas.

Typical pedon of Symerton silt loam, in a cultivated area of Markham-Symerton silt loams, 2 to 6 percent slopes, eroded; 920 feet east and 900 feet south of the northwest corner of sec. 20, T. 20 N., R. 10 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; mixed with dark yellowish brown (10YR 4/4) silty clay loam from the subsoil; moderate fine granular structure; friable; few coarse and many medium and fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; many fine and medium roots; thin continuous brown (10YR 4/3) clay films on faces of peds; common dark brown (10YR 3/3) organic coatings along root channels; slightly acid; clear wavy boundary.

2Bt2—20 to 28 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; friable; many fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few dark brown (10YR 3/3) organic coatings along root channels; about 5 percent gravel; neutral; clear wavy boundary.

2Bt3—28 to 32 inches; brown (7.5YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; about 13 percent gravel; neutral; abrupt irregular boundary.

3Bt4—32 to 39 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) and common medium distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous brown (10YR 5/3) clay films on faces of peds; about 4 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

3BCt—39 to 44 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium faint grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin patchy brown (10YR 5/3) clay films on faces of peds; about 3 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

3Cd—44 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; firm; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 30 to 50 inches thick. The silty deposits are less than 24 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is loam or silt loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly clay loam, silty clay loam, loam, or sandy clay loam, but in some pedons it is gravelly sandy clay loam or gravelly clay loam in the lower part. The content of gravel in the upper part ranges from 0 to 5 percent, and that in the lower part ranges from 5 to 20 percent. The 3Bt and 3Cd horizons are silt loam or silty clay loam. The content of gravel ranges from 2 to 10 percent in these horizons. The content of clay is more than 22 percent in the 3Cd horizon. The 3Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. The 3Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Tuscola Series

The Tuscola series consists of deep, moderately well drained soils. These soils formed in loamy outwash on moraines. Permeability is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 2 to 12 percent.

The Tuscola soils in this county are browner in the upper part of the subsoil than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Tuscola soils are similar to Glenhall and Martinsville soils and are adjacent to Cyclone and Starks soils. Glenhall soils have a surface layer that is darker than that of the Tuscola soils. Martinsville soils do not have gray mottles in the lower part of the subsoil. Cyclone and Starks soils are grayer in the subsoil than the Tuscola soils and have less sand in the solum. Cyclone soils are in the lower lying depressions, and Starks soils are in the less sloping positions on the landscape.

Typical pedon of Tuscola silt loam, till substratum, 2 to 6 percent slopes, eroded, in a cultivated field; 2,100 feet east and 300 feet north of the southwest corner of sec. 28, T. 23 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/4) material from the subsoil; moderate fine granular structure; friable; common very fine roots; about 3 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—8 to 19 inches; yellowish brown (10YR 5/4) loam; moderate fine subangular blocky structure; friable; common very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; medium acid; clear wavy boundary.

Bt2—19 to 31 inches; brown (7.5YR 5/4) clay loam; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 3 percent gravel; medium acid; clear wavy boundary.

Bt3—31 to 39 inches; brown (7.5YR 5/4) loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 4 percent gravel; slightly acid; clear wavy boundary.

BC—39 to 49 inches; brown (7.5YR 5/4) sandy loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very friable; about 4 percent gravel; slightly acid; gradual wavy boundary.

C—49 to 58 inches; brown (10YR 5/3) sandy loam; common medium distinct light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/8) mottles; massive; very friable; thin strata of silt loam and loamy fine sand; about 4 percent gravel; neutral; abrupt irregular boundary.

2Cd—58 to 60 inches; yellowish brown (10YR 5/4) loam; few fine distinct light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/6) mottles; massive; firm; about 6 percent gravel; slight effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The content of gravel ranges from 0 to 10 percent throughout the profile. The Ap horizon is silt loam or loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is sandy loam, fine sandy loam, or silt loam and has sandy strata. The 2Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Varna Series

The Varna series consists of deep, moderately well drained, moderately slowly permeable soils. These soils formed in glacial till on ground moraines and end moraines. Slopes range from 1 to 3 percent.

Varna soils are similar to Corwin, Markham, and Symerton soils and are adjacent to Elliott and Symerton soils. Corwin soils have less clay in the subsoil and in the underlying material than the Varna soils, and Markham soils have a thinner surface layer. Symerton soils have less clay in the upper part of the subsoil than the Varna soils. They are in landscape positions similar to those of the Varna soils. Elliott soils are grayer in the subsoil than the Varna soils. They are in the slightly lower lying areas.

Typical pedon of Varna silt loam, in a cultivated area of Symerton-Varna silt loams, 1 to 3 percent slopes; 1,850 feet east and 20 feet north of the southwest corner of sec. 26, T. 23 N., R. 10 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

A—7 to 11 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine roots; medium acid; clear wavy boundary.

Bt1—11 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; many very dark brown (10YR 2/2) organic films and root channels; about 1 percent gravel; medium acid; clear smooth boundary.

Bt2—16 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; few very dark brown (10YR 2/2) organic films and root channels; about 2 percent gravel; slightly acid; clear wavy boundary.

Bt3—27 to 34 inches; light olive brown (2.5Y 5/4) silty clay; common fine faint grayish brown (2.5Y 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; neutral; gradual wavy boundary.

BCt—34 to 44 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium faint grayish brown (2.5Y 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

Cd—44 to 60 inches; light olive brown (2.5Y 5/4) silt loam; common medium faint grayish brown (2.5Y 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; common light gray (10YR 7/1) accumulations of calcium carbonate; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 35 to 50 inches thick. The A 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 and value of 4 or 5. It has chroma of 3 or 4 in the upper part and chroma of 2 to 4 in the lower part. The Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. It is silt loam or silty clay loam in which the content of clay is more than 22 percent.

Wakeland Variant

The Wakeland Variant consists of deep, somewhat poorly drained soils. These soils formed in silty and loamy alluvium on flood plains. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part of the underlying material. Slopes range from 0 to 2 percent.

Wakeland Variant soils are adjacent to Beckville, Miami, and Williamstown soils. Beckville soils have less silt than the Wakeland Variant soils. They are in the higher lying areas. Miami and Williamstown soils are browner than the Wakeland Variant soils and have more sand. They are in the higher upland areas.

Typical pedon of Wakeland Variant silt loam, occasionally flooded, in a wooded area; 100 feet east and 2,400 feet north of the southwest corner of sec. 16, T. 21 N., R. 8 W.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; very friable; many very fine and fine roots; about 1 percent gravel; neutral; clear wavy boundary.

Bw1—6 to 21 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct yellowish brown (10YR 5/4) and few fine distinct gray (10YR 5/1) mottles; weak fine subangular blocky structure; very friable; many very fine and fine roots; thin discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bw2—21 to 31 inches; grayish brown (10YR 5/2) silt loam; many fine distinct yellowish brown (10YR 5/4) and common medium faint gray (10YR 5/1) mottles; weak fine subangular blocky structure; very friable; common very fine roots; thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; about 1 percent gravel; neutral; gradual wavy boundary.

Cg1—31 to 45 inches; gray (10YR 5/1) silt loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; massive; very friable; few very fine roots; about 1 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg2—45 to 60 inches; dark grayish brown (10YR 4/2) very fine sandy loam; common medium distinct yellowish brown (10YR 5/4) and common fine distinct light brownish gray (10YR 6/2) mottles; massive; very friable; about 2 percent gravel; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches. The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The Bw horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6.

Wallkill Variant

The Wallkill Variant consists of deep, very poorly drained soils. These soils formed in sediments washed from the adjacent slopes and deposited over organic material in potholes on ground moraines and end moraines. Permeability is moderately slow in the mineral layers and moderately slow to moderately rapid in the organic layers. Slopes range from 0 to 2 percent.

Wallkill Variant soils are adjacent to Houghton, Peotone, and Warners Variant soils. The adjacent soils are in the more concave areas. Houghton soils formed in organic deposits. Peotone and Warners Variant soils formed in mineral material and are not underlain by organic material.

Typical pedon of Wallkill Variant silty clay loam, in a cultivated field; 260 feet west and 520 feet south of the northeast corner of sec. 22, T. 23 N., R. 7 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

A1—9 to 19 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; many very fine roots; slightly acid; clear wavy boundary.

A2—19 to 31 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; few very fine roots; medium acid; abrupt wavy boundary.

Oa1—31 to 47 inches; sapric material, very dark gray (10YR 3/1) broken face, very dark brown (10YR 2/2) rubbed; about 35 percent fiber, 4 percent rubbed; moderate medium platy structure; friable; mostly herbaceous fibers; about 2 percent mineral material; slightly acid; gradual wavy boundary.

Oa2—47 to 60 inches; sapric material, dark brown (7.5YR 3/2) broken face, very dark grayish brown (10YR 3/2) rubbed; about 40 percent fiber, 5 percent rubbed; weak thick platy structure; friable; mostly herbaceous fibers; about 1 percent mineral material; neutral.

The mineral soil that overlies the organic material ranges from 16 to 40 inches in thickness. The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silty clay. The Oa horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue. In some pedons thin layers of hemic material are in the lower part. The fiber content is less than 10 percent after rubbing.

Warners Variant

The Warners Variant consists of deep, very poorly drained soils. These soils formed in lacustrine sediments in potholes on ground moraines and till plains. Permeability is moderately slow or slow in the solum and moderately rapid in the lower part of the underlying material. Slopes range from 0 to 2 percent.

Warners Variant soils are adjacent to Houghton, Milford, Peotone, and Wallkill Variant soils. Houghton soils formed in organic deposits. Milford and Peotone soils are in the more concave areas. They have more clay in the subsoil than the Warners Variant soils. Wallkill Variant soils formed in mineral material less than 40 inches deep over organic deposits. They are in the less concave areas.

Typical pedon of Warners Variant silty clay, drained, in a cultivated field; 1,900 feet south and 900 feet west of the northeast corner of sec. 35, T. 21 N., R. 10 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silty clay, dark grayish brown (10YR 4/2) dry; weak medium granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

A—9 to 16 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; many very fine roots; neutral; clear wavy boundary.

Bg1—16 to 25 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; many black (10YR 2/1) krotovinas and root channels; neutral; clear wavy boundary.

Bg2—25 to 35 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent strong brown (7.5YR 5/6) and common medium distinct gray (5Y 5/1) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; few very fine roots; many black (10YR 2/1) krotovinas and root channels; neutral; clear wavy boundary.

Cg1—35 to 48 inches; light brownish gray (2.5Y 6/2) marl; many medium distinct light olive brown (2.5Y 5/4) mottles; massive; friable; common very dark gray (10YR 3/1) krotovinas and root channels; many white (10YR 8/2) shell fragments; violent effervescence; moderately alkaline; abrupt wavy boundary.

Cg2—48 to 60 inches; grayish brown (2.5Y 5/2) fine sandy loam that has thin strata of silt loam; common medium distinct gray (5Y 5/1) and many fine distinct light olive brown (2.5Y 5/6) mottles; massive; very friable; about 5 percent gravel; strong effervescence; moderately alkaline.

The mineral soil ranges from 20 to 40 inches in thickness. The marl ranges from 2 to 20 inches in thickness. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 or 2, or it is neutral in hue. It is silty clay loam or silty clay. The Cg1 horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2, or it is neutral in hue. The Cg2 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6, or it is neutral in hue. The content of gravel in this horizon ranges from 0 to 15 percent.

Washtenaw Series

The Washtenaw series consists of deep, poorly drained soils. These soils formed in silty alluvium and glacial drift on end moraines. Permeability is moderate in the upper part of the profile and slow in the lower part. Slopes range from 0 to 2 percent.

The Washtenaw soils in this county contain less sand than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Washtenaw soils are adjacent to Miami, Milford, Peotone, and Strawn soils. Miami and Strawn soils are browner than the Washtenaw soils and have more sand. Milford and Peotone soils have more clay than the Washtenaw soils. They are in the more concave areas.

Typical pedon of Washtenaw silt loam, in a cultivated field; 600 feet west and 600 feet north of the southeast corner of sec. 35, T. 22 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common very fine roots; neutral; abrupt smooth boundary.

C—8 to 22 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate fine granular structure; friable; few very fine roots; neutral; clear wavy boundary.

2Ab—22 to 36 inches; very dark gray (10YR 3/1) silty clay loam; moderate very fine subangular blocky structure; friable; neutral; clear wavy boundary.

2Btgb1—36 to 44 inches; dark gray (5Y 4/1) silty clay loam; common fine distinct light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous dark gray (N 4/0) clay films on faces of peds; neutral; gradual wavy boundary.

2Btgb2—44 to 50 inches; gray (5Y 5/1) silty clay loam; common fine distinct light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark gray (5Y 4/1) clay films on faces of peds; neutral; gradual wavy boundary.

2Cg—50 to 60 inches; gray (5Y 5/1) silty clay loam; many medium distinct light olive brown (2.5Y 5/6) mottles; massive; firm; neutral.

The thickness of the overwash ranges from 20 to 40 inches. 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 1 or 2. The 2Ab horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The 2Btgb horizon has hue of 10YR, 2.5Y, or

5Y, value of 4 to 6, and chroma of 1 or 2. The 2Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 to 4. It is silty clay loam or silt loam.

Waupecan Series

The Waupecan series consists of deep, moderately well drained soils. These soils formed in silty sediments and loamy and gravelly outwash on outwash plains and terraces. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 2 percent.

Waupecan soils are similar to Proctor and Rush soils and are adjacent to Comfrey and Lafayette soils. Proctor soils have less gravel in the lower part of the subsoil and in the underlying material than the Waupecan soils, and Rush soils have a lighter colored surface layer. Comfrey soils are in the lower lying depressions on flood plains. They are grayer in the subsoil than the Waupecan soils. Lafayette soils are in the slightly lower lying positions on the landscape. They have gray mottles in the upper part of the subsoil.

Typical pedon of Waupecan silt loam, moderately wet, 0 to 2 percent slopes, in a cultivated field; 150 feet east and 1,800 feet south of the center of sec. 8, T. 22 N., R. 9 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

A—9 to 12 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; many very fine roots; slightly acid; clear wavy boundary.

Bt1—12 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common very fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear wavy boundary.

Bt2—22 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; common very fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; medium acid; clear wavy boundary.

2Bt3—34 to 43 inches; yellowish brown (10YR 5/4) loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent gravel; slightly acid; gradual wavy boundary.

2Bt4—43 to 54 inches; brown (7.5Y 5/4) sandy loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; very friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 14 percent gravel; neutral; clear wavy boundary.

2Bt5—54 to 62 inches; yellowish brown (10YR 5/4) gravelly sandy loam; many medium distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; very friable; thin discontinuous dark yellowish brown (10YR 4/4) clay bridges between sand grains; about 22 percent gravel; neutral; clear wavy boundary.

3C—62 to 80 inches; brown (10YR 5/3) very gravelly coarse sand; single grain; loose; about 40 percent gravel; slight effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is loam or sandy loam in the upper part and gravelly sandy loam or gravelly loamy sand in the lower part. The content of gravel is 5 to 15 percent in the upper part and 15 to 25 percent in the lower part. The 3C horizon has hue of 10YR, value of 4 to 7, and chroma of 3 to 6. It is gravelly coarse sand, very gravelly coarse sand, or gravelly loamy coarse sand. The content of gravel in this horizon is 15 to 50 percent.

Weikert Variant

The Weikert Variant consists of moderately deep, well drained, moderately rapidly permeable soils. These soils formed in material weathered from sandstone on breaks on bedrock terraces. Slopes range from 35 to 80 percent.

Weikert Variant soils are similar to Gosport soils and are adjacent to High Gap and Shadeland Variant soils. Gosport soils formed in shale residuum and contain less sand and more clay throughout than the Weikert Variant soils. High Gap and Weikert Variant soils are in the less sloping areas near the breaks. High Gap soils have more clay in the solum than the Weikert Variant soils, and Shadeland Variant soils are grayer and have more clay in the subsoil.

Typical pedon of Weikert Variant fine sandy loam, 35 to 80 percent slopes, very bouldery, in a wooded area; 1,100 feet east and 400 feet south of the center of sec. 11, T. 21 N., R. 8 W.

A—0 to 5 inches; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many very fine and fine roots; about 10 percent sandstone fragments; very strongly acid; clear wavy boundary.

Bw1—5 to 15 inches; dark yellowish brown (10YR 4/4) channery fine sandy loam; weak fine subangular blocky structure; friable; many very fine and fine roots; common dark brown (10YR 3/3) organic coatings on faces of peds; about 20 percent sandstone fragments; very strongly acid; clear wavy boundary.

Bw2—15 to 27 inches; yellowish brown (10YR 5/4) channery sandy loam; weak fine subangular blocky structure; friable; common very fine and fine roots; about 25 percent sandstone fragments; very strongly acid; gradual wavy boundary.

Cr—27 to 34 inches; yellowish brown (10YR 5/6) weathered sandstone that parts easily to sandy loam; massive; firm; common very fine and fine roots; very strongly acid; clear wavy boundary.

R—34 inches; unweathered sandstone bedrock; very strongly acid.

The solum is 20 to 40 inches thick. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 3. The content of coarse fragments in this horizon is 3 to 15 percent. The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. The content of coarse fragments in this horizon is 15 to 35 percent. The Cr horizon has colors similar to those of the Bw horizon.

Williamsport Series

The Williamsport series consists of deep, somewhat poorly drained soils. These soils formed in loess or other silty sediments, loamy outwash, and glacial till on ground moraines and end moraines. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 2 percent.

Williamsport soils are similar to Elliott, Gilboa, and Ipava soils and are adjacent to Drummer, Elliott, and Symerton soils. Elliott soils have a solum that is thinner than that of the Williamsport soils. They in positions on the landscape similar to those of the Williamsport soils. Drummer and Gilboa soils have less clay in the subsoil than the Williamsport soils, and Ipava soils have less sand in the lower part of the subsoil. Drummer soils are grayer in the subsoil than the Williamsport soils. They are in the lower lying depressions. Symerton soils are in the more sloping or higher lying positions on the landscape. They are brown and have less clay in the subsoil than the Williamsport soils.

Typical pedon of Williamsport silt loam, in a cultivated area of Williamsport-Elliott silt loams, 0 to 2 percent slopes; 400 feet west and 80 feet south of the center of sec. 17, T. 20 N., R. 10 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak medium granular; friable; common very fine and fine roots; neutral; abrupt smooth boundary.

A—8 to 11 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; common very fine and fine roots; neutral; clear wavy boundary.

Bt1—11 to 18 inches; dark brown (10YR 4/3) silty clay; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate very fine subangular blocky structure; friable; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark gray (10YR 3/1) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; slightly acid; clear wavy boundary.

Bt2—18 to 30 inches; brown (10YR 5/3) silty clay loam; many medium faint yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) and many fine distinct brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark gray (10YR 3/1) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

2Bt3—30 to 44 inches; yellowish brown (10YR 5/4) loam; many medium distinct grayish brown (10YR 5/2) and many fine distinct brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; friable; about 6 percent gravel; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few very dark gray (10YR 3/1) krotovinas; neutral; abrupt irregular boundary.

3Bt4—44 to 51 inches; light olive brown (2.5Y 5/4) silt loam; many medium faint grayish brown (2.5Y 5/2) and many fine distinct olive yellow (2.5Y 6/6) mottles; moderate medium subangular blocky structure; firm; about 2 percent gravel; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; slight effervescence; moderately alkaline; clear wavy boundary.

3Cd—51 to 60 inches; light olive brown (2.5Y 5/4) silt loam; many fine distinct light gray (2.5Y 7/2), common fine distinct yellowish brown (10YR 5/8), and common fine faint grayish brown (2.5Y 5/2) mottles; massive; firm; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum ranges from 50 to 60 inches in thickness. Depth to the 3Bt horizon ranges from 40 to 50 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt and 2Bt horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 6. The content of gravel in these horizons ranges from 3 to 15 percent. The 3Bt and 3Cd horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. They are silt loam or silty clay loam. The content of gravel in these horizons is 1 to 5 percent. The content of clay is 24 to 30 percent in the 3Cd horizon.

Williamstown Series

The Williamstown series consists of deep, moderately well drained soils. These soils formed in silty deposits and glacial till on ground moraines and end moraines. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 12 percent.

The Williamstown soils in this county are taxadjuncts to the series because they do not have gray mottles in the upper part of the subsoil. This difference, however, does not alter the usefulness or behavior of the soils.

Williamstown soils are similar to Rainsville and Rockfield soils and are adjacent to Cyclone, Miami, Rainsville, Rockfield, Strawn, and Wakeland Variant soils. Rainsville and Rockfield soils are in landscape positions similar to those of the Williamstown soils. They have a solum that is thicker than that of the Williamstown soils. Also, Rockfield soils have more silt and less sand in the upper part of the subsoil. Cyclone soils have a subsoil that is grayer than that of the Williamstown soils and have less sand in the solum. They are in depressional areas. Miami and Strawn soils do not have gray mottles in the lower part of the subsoil. Strawn soils have a solum that is thinner than that of the Williamstown soils. They are in the more sloping positions on the landscape. Wakeland Variant soils are grayer than the Williamstown soils and have less sand. They are in the lower lying positions on flood plains, adjacent to the base of the slopes.

Typical pedon of Williamstown silt loam, in a cultivated area of Rainsville-Williamstown-Rockfield silt loams, 2 to 6 percent slopes, eroded; 2,590 feet west and 405 feet north of the southeast corner of sec. 21, T. 22 N., R. 8 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; mixed with light yellowish brown (10YR 6/4) material from the subsoil; moderate medium granular structure; friable; common very fine roots; neutral; abrupt smooth boundary.

BE—7 to 9 inches; light yellowish brown (10YR 6/4) silt loam; moderate fine subangular blocky structure; friable; common very fine roots; slightly acid; abrupt wavy boundary.

2Bt1—9 to 20 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; slightly acid; clear wavy boundary.

2Bt2—20 to 30 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

2Bt3—30 to 35 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; slight effervescence; mildly alkaline; gradual wavy boundary.

2Cd—35 to 60 inches; light olive brown (2.5Y 5/4) loam; common fine distinct grayish brown (10YR 5/2) mottles; massive; firm; few white (10YR 8/2) accumulations of calcium carbonate; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The 2Cd horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

Formation of the Soils

This section relates the major factors of soil formation to the soils in Warren County. It also describes the processes that have affected the soils in the county.

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 formed; 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. Relief conditions the effects of climate and plant and animal life. The parent material 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. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. In Warren County the rugged preglacial landscape consisted mainly of shale, sandstone, and siltstone bedrock and partly of coal and limestone. Several glaciers, advancing from different directions, subsequently covered the county. Glacial deposits covered most of the bedrock formations. They were derived from rocks similar to those they covered. The Wisconsin Glaciation, about 10,000 to 15,000 years ago, had the most influence on soil formation in the county.

The parent material of the soils of Warren County varies greatly, sometimes within small areas, depending on how the material was deposited. The glacier or meltwater from the glacier deposited most of the material. The subsequent actions of water and wind reworked and redeposited some of the material. The kinds of parent materials in Warren County are mainly glacial till, glacial outwash, lacustrine material, eolian material, alluvium, organic material, and shale and sandstone residuum.

Glacial till is material that glaciers laid down with a minimum of water action. It consists of mixed particles of different sizes. Many of the small pebbles in the glacial till in Warren County have sharp corners, indicating that water action has not worn them down. The glacial till is calcareous, firm or very firm loam, silt loam, or silty clay loam. It is typically light olive brown, yellowish brown, brown, or light yellowish brown. On the lower parts of steep breaks, however, it has a pinkish tint. Montmorenci soils are an example of soils that formed in glacial till. These soils typically are loamy and have a well developed structure.

Glacial outwash was deposited by running water from melting glaciers. The size of the particles that make up outwash varies, depending on the speed of the stream of water that carried the material. As the swiftly flowing water slowed down, the coarser particles were deposited. The more slowly moving water could carry the finer particles, such as very fine sand, silt, and clay. Glacial outwash deposits generally occur as layers of particles of similar size. Boyer soils are an example of soils that formed in glacial outwash.

Lacustrine material was deposited in still, or ponded, glacial meltwater. The coarser fragments had dropped out of the moving water as glacial outwash. Only the finer particles, such as very fine sand, silt, and clay, remained to settle out in the still water. The lacustrine material in Warren County is silty or clayey. Warners

Variant soils formed in this material.

Eolian material in Warren County is silty material called loess, which was deposited by the wind. The loess ranges from a few inches to several feet in thickness. It is thickest in areas adjacent to the bottom land along the major streams. It covered the glacial till and glacial outwash. This mantle of loess was important in the formation of the soils in the county. On the steeper soils, most of this silty material was washed away. On the less sloping soils, however, it remained as part of the soil profile. Alford soils are an example of soils that formed in more than 5 feet of loess. Rockfield and Williamsport are examples of soils that formed in loess and in glacial outwash and glacial till.

Alluvium is material recently deposited by the floodwater of present streams. It is the youngest parent material in Warren County. Its range in texture depends on the speed of the water from which it was deposited. The deposits of a swiftly moving stream are coarser textured than those of a sluggish stream. Stonelick and Armiesburg Variant soils formed in alluvium.

Organic material consists of deposits of plant remains. After the glaciers receded from the survey area, water stood in depressions. Grasses and sedges grew and died at the edges of these bodies of water, and their remains fell to the bottom. These bodies of water were eventually filled with organic material and thus developed into areas of peat. In some areas the peat subsequently decomposed to muck. In other areas it has changed little since deposition. Houghton soils are an example of soils that formed in organic material.

Bedrock residuum is the oldest parent material in the county. Mississippian-age shale and siltstone are along the lower walls of the valley of the Wabash River north of Williamsport and along Little Pine Creek in the northeastern part of the county. Gosport soils are an example of soils that formed in residuum of Mississippian bedrock (fig. 12). Pennsylvanian-age bedrock, which overlies the Mississippian-age bedrock, consists of sandstone, siltstone, and shale and thin beds of coal and limestone. It is dominantly in areas along the Wabash River south of Williamsport, on a few rises northeast of Independence, and along Big Pine Creek and Redwood Creek. Weikert Variant soils are an example of soils that formed in residuum of Pennsylvanian-age bedrock.

Climate

Climate is important in the formation of soils. It determines the kind of plant and animal life on and in the soil. It also determines the amount of water available for the weathering of minerals and the translocation of soil material. It influences soil temperature and determines the rate of chemical reactions in the soil.

The climate in Warren County is humid and temperate. It is presumably similar to that which existed when the soils formed. The soils in the county differ from those that formed under a dry, warm climate and from those that formed under a hot, moist climate. The climate is uniform throughout the county, although runoff locally modifies its effect. The differences among the soils in the county result only to a minor extent from differences in climate.

Plant and Animal Life

Plants have been the principal organisms influencing the soils in Warren County; however, bacteria, fungi, earthworms, and human activities have also been important. The chief contributions of plant and animal life are additions of organic material and nitrogen to the soil, the transformation of litter into humus, and mixing of the soil. The remains of plants and animals accumulate in the soil, decay, and eventually become organic matter. Bacteria and other microorganisms help to break down the organic matter so that it can be used by growing plants. Earthworms and decayed plant roots provide channels for the movement of air and water through the soil.

The native vegetation at the time when the county was first settled was either prairie grasses or trees. It was mainly prairie grasses in the western third of the county, in the northeastern part, and in some areas of the north-central part. It was deciduous forest in the rest of the county.

Differences in natural soil drainage and in parent material have affected the plant composition on the soils. The prairie can be divided into three groups based on the drainage class of the soils. The moderately well drained soils, such as Proctor and Symerton soils, were covered mainly by little bluestem, flowering spurge, roundhead lespedeza, switchgrass, and wholeleaf rosinweed. The somewhat poorly drained soils, such as Brenton and Williamsport soils, were covered mainly by big bluestem, Canada wildrye, compassplant, stiff goldenrod, and indiangrass. The poorly drained soils, such as Drummer and Sable soils, were covered mainly by bluejoint reedgrass and prairie cordgrass. All of these soils have a considerable amount of organic matter, especially Drummer and Sable soils.

The woodland in Warren County is in areas of both the better drained and wetter soils. The better drained soils support American elm, hickory, black cherry, white

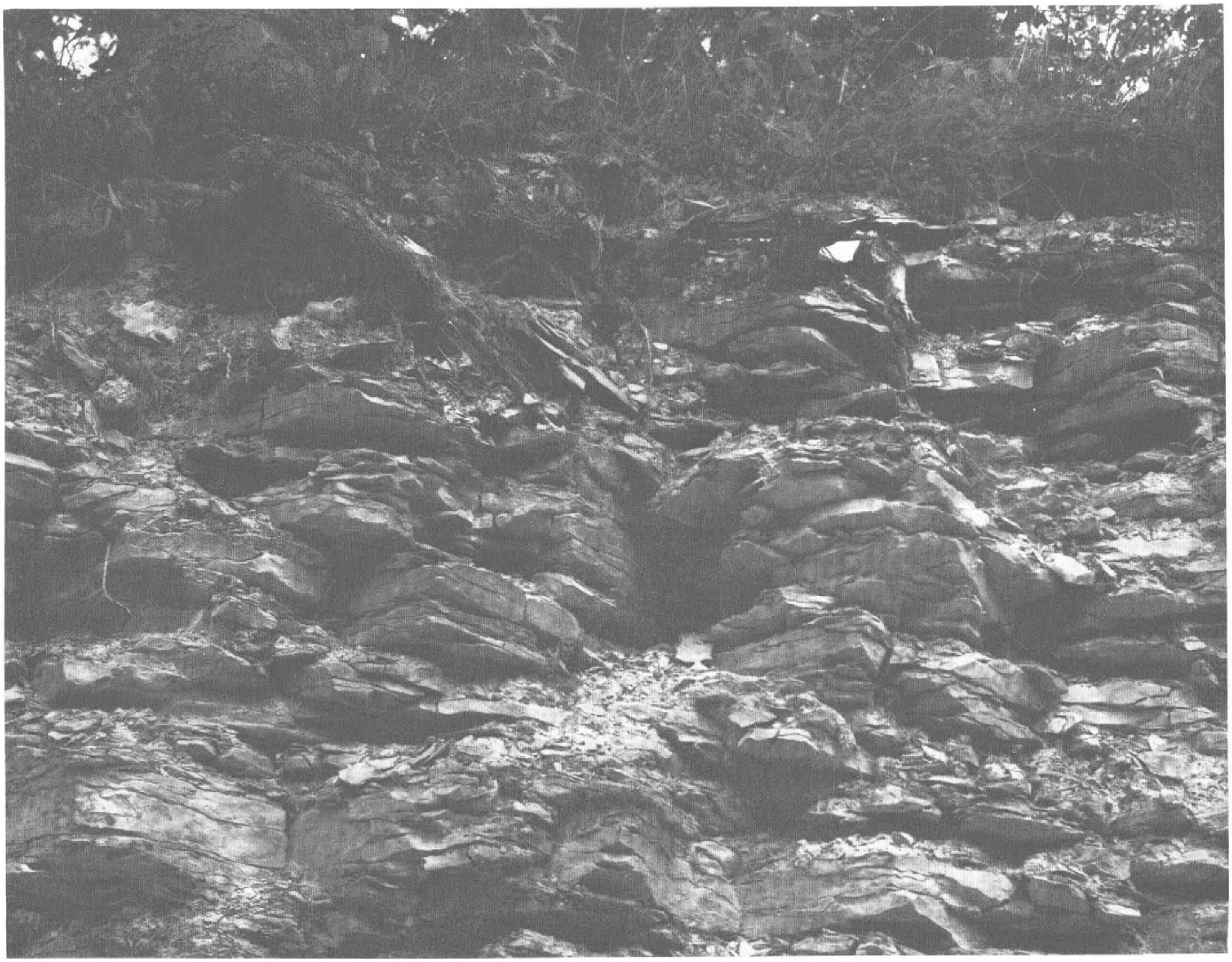

Figure 12.—Borden shale of the Mississippian Formation, which is the parent material of Gosport soils.

oak, red oak, and sugar maple. The wetter soils support white ash, silver maple, pin oak, black ash, American sycamore, and eastern cottonwood. They include Cyclone and Starks soils. Cyclone soils support not only trees but also swamp grasses and sedges. The soils that formed dominantly under forest vegetation generally have less organic matter than those that formed under grasses.

Relief

Relief has markedly influenced the soils in Warren County through its affect on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes in the county generally range from 0 to 70 percent. Some small areas have steeper slopes. Runoff is fastest on the steeper slopes. Water temporarily ponds in low areas.

Natural soil drainage in the county ranges from excessively drained on some ridgetops to very poorly drained in depressions. Through its effect on aeration of the soil, drainage generally determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained soils. In well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized. Poorly aerated soils are generally dull gray and mottled. For example, Rodman soils, which are well aerated and excessively drained, have brighter colors than Ragsdale soils, which are poorly aerated and very poorly drained.

Time

Time is required for the transformation of the parent material into a soil that has distinct horizons. Differences in length of time that the parent material has been in place are commonly reflected in the degree of profile development in the soil. Some soils form rapidly, and others form slowly.

The soils in Warren County range from young to mature. Many of the soils formed in glacial deposits. These soils have been exposed to soil-forming factors for a long enough time to allow distinct horizons to develop within the soil profile. Soils that formed in recent alluvial sediments, however, have not been in place long enough for the development of distinct horizons. They are considered young. Piankeshaw Variant soils are an example.

Processes of Soil Formation

The processes involved in soil formation are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils in Warren County. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as Drummer and Peotone soils, have a thick, black surface horizon.

Carbonates and bases have been leached from the upper horizons of nearly all of the soils in the county. Leaching is generally believed to precede the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Some leaching has taken place even in the wettest soils, which do not have carbonates but are acid. The leaching of wet soils is minimal because of the seasonal high water table or the slow movement of water through the profile.

Clay particles accumulate in pores and other voids in the soil and form films on faces of peds. Water moves along these films. The leaching of bases and the translocation of silicate clays are among the more important processes of horizon differentiation in the soils of this county. In Cadiz soils, for example, translocated silicate clays have accumulated in the Bt horizon in the form of clay films.

Gleying, or the reduction and transfer of iron, has occurred in most of the very poorly drained, poorly drained, and somewhat poorly drained soils in the county. It has significantly affected horizon differentiation in these soils. A gray color in the subsoil indicates the reduction of iron oxides. The reduction is commonly accompanied by some transfer of iron, either from upper horizons to lower horizons or completely out of the profile. Mottles, which are in many horizons, indicate the segregation of iron.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; 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—

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

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.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

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.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

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.

End moraine. See Terminal moraine.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

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.

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.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

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 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.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of 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.

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.)

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.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

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.

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 degrees of acidity or alkalinity, expressed as pH values, are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

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.

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.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

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.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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 multiplied 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.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

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, in millimeters, of separates recognized in the United States are as follows:

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 soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

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 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.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Underlying material. See Substratum.

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.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

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 a 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 1951-72 at Fowler, Indiana)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	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
	^{o}F	^{o}F	^{o}F	^{o}F	^{o}F	Units	In	In	In		In
January----	33.0	16.5	24.7	63	-13	0	1.93	0.83	2.85	5	5.6
February---	36.7	19.0	27.9	61	-8	0	1.29	.69	1.81	4	5.6
March------	46.9	27.6	37.2	79	3	30	2.27	1.15	3.24	6	4.1
April------	63.5	40.6	52.1	84	22	108	4.35	2.77	5.77	9	1.3
May--------	74.3	50.7	62.6	92	31	400	3.30	1.72	4.68	7	.0
June-------	82.8	59.5	71.2	98	43	636	4.27	1.97	6.24	7	.0
July-------	85.7	63.3	74.5	98	48	760	4.70	2.37	6.73	6	.0
August-----	84.2	61.6	72.9	96	46	710	2.87	1.88	3.76	5	.0
September--	78.9	54.8	66.9	95	35	507	3.62	1.05	5.69	5	.0
October----	64.7	42.5	53.6	85	23	141	3.25	1.48	4.76	6	.0
November---	49.2	31.1	40.2	72	8	12	2.24	1.41	2.99	6	2.9
December---	37.8	22.6	30.2	64	-7	0	2.50	.69	3.94	6	5.0
Yearly:											
Average---	61.5	40.8	51.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	98	-14	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,304	36.59	32.09	43.02	72	24.5

* 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 (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-72 at Fowler, Indiana)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 14	Apr. 26	May 15
2 years in 10 later than--	Apr. 10	Apr. 21	May 9
5 years in 10 later than--	Apr. 2	Apr. 12	Apr. 28
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 28	Oct. 17	Oct. 2
2 years in 10 earlier than--	Nov. 1	Oct. 21	Oct. 7
5 years in 10 earlier than--	Nov. 7	Oct. 29	Oct. 18

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-72 at Fowler, Indiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	202	182	149
8 years in 10	208	188	157
5 years in 10	219	199	172
2 years in 10	229	210	188
1 year in 10	235	215	196

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AfB2	Alford silt loam, 2 to 6 percent slopes, eroded	639	0.3
Am	Armiesburg Variant silty clay loam, frequently flooded	1,811	0.8
BbA	Barce silt loam, 0 to 2 percent slopes	1,058	0.4
BdB2	Barce-Montmorenci silt loams, 2 to 6 percent slopes, eroded	11,612	4.9
Be	Beaucoup silty clay loam, frequently flooded, undrained	688	0.3
Bk	Beckville loam, occasionally flooded	1,083	0.5
BmB2	Billett sandy loam, 1 to 4 percent slopes, eroded	845	0.4
BnC2	Billett sandy loam, 6 to 12 percent slopes, eroded	201	0.1
BoA	Blount silt loam, 0 to 2 percent slopes	1,234	0.5
BpD2	Boyer-Mudlavia complex, 8 to 20 percent slopes, eroded	703	0.3
BrA	Brenton silt loam, 0 to 2 percent slopes	2,092	0.9
BsA	Brenton silt loam, till substratum, 0 to 2 percent slopes	13,867	5.9
BwA	Brenton silt loam, moderately fine substratum, 0 to 2 percent slopes	3,200	1.4
CaB2	Cadiz silt loam, moderately wet, 1 to 6 percent slopes, eroded	6,694	2.9
CbA	Camden silt loam, 0 to 2 percent slopes	795	0.3
CbB2	Camden silt loam, 2 to 6 percent slopes, eroded	826	0.4
CdB2	Camden silt loam, till substratum, 2 to 6 percent slopes, eroded	577	0.2
CfA	Carmi loam, 0 to 2 percent slopes	228	0.1
Cg	Comfrey loam, stratified substratum, rarely flooded	716	0.3
Cs	Comfrey loam, stratified substratum, frequently flooded, undrained	2,265	1.0
CtB2	Corwin silt loam, 2 to 6 percent slopes, eroded	465	0.2
Cz	Cyclone silty clay loam	3,703	1.6
Dw	Drummer silty clay loams	33,557	14.3
Dx	Drummer silty clay loam, gravelly substratum	1,576	0.7
Dy	Du Page loam, frequently flooded	794	0.3
EdB2	Eldean gravelly loam, 2 to 6 percent slopes, eroded	855	0.4
EgA	Eldean silt loam, 0 to 2 percent slopes	454	0.2
EvA	Elston sandy loam, 0 to 3 percent slopes	518	0.2
GgA	Gilboa silt loam, 0 to 2 percent slopes	4,311	1.8
GhB2	Glenhall silt loam, 1 to 4 percent slopes, eroded	1,618	0.7
GkB2	Glenhall silt loam, till substratum, 1 to 4 percent slopes, eroded	1,151	0.5
GoF	Gosport shaly silt loam, 25 to 40 percent slopes	483	0.2
HeG	Hennepin loam, 30 to 70 percent slopes	5,635	2.4
HfB	High Gap silt loam, 2 to 9 percent slopes, stony	916	0.4
HhB2	High Gap Variant loam, 2 to 6 percent slopes, eroded	466	0.2
HhC2	High Gap Variant loam, 6 to 12 percent slopes, eroded	202	0.1
Hm	Houghton muck, drained	270	0.1
Ho	Houghton muck, undrained	357	0.2
IoB2	Iona silt loam, 1 to 4 percent slopes, eroded	1,288	0.5
IpA	Ipava silt loam, 0 to 2 percent slopes	1,051	0.4
Ju	Jules silt loam, frequently flooded	818	0.3
LcA	Lafayette silt loam, 0 to 2 percent slopes	930	0.4
Ld	La Hogue silt loam, 0 to 2 percent slopes	1,673	0.7
Lk	La Hogue silt loam, till substratum, 0 to 2 percent slopes	1,000	0.4
Lp	Landes-Chatterton complex, frequently flooded	1,625	0.7
MaB3	Markham silty clay loam, 2 to 6 percent slopes, severely eroded	602	0.3
McB2	Markham-Symerton silt loams, 2 to 6 percent slopes, eroded	10,262	4.4
MdA	Martinsville loam, 0 to 2 percent slopes	295	0.1
MdB2	Martinsville loam, 2 to 6 percent slopes, eroded	1,498	0.6
MdC2	Martinsville loam, 6 to 12 percent slopes, eroded	577	0.2
MoE2	Miami loam, 15 to 25 percent slopes, eroded	2,158	0.9
MpC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	4,292	1.8
MpD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	455	0.2
Mr	Milford silty clay loam, pothole	1,555	0.7
MtA	Millbrook silt loam, till substratum, 0 to 2 percent slopes	814	0.3
MuC2	Montmorenci-Barce complex, 6 to 12 percent slopes, eroded	200	0.1
MvE2	Morley silt loam, moderately wet, 15 to 25 percent slopes, eroded	847	0.4
MwC3	Morley silty clay loam, moderately wet, 6 to 12 percent slopes, severely eroded	2,185	0.9
MxC2	Morley-Cadiz silt loams, moderately wet, 6 to 12 percent slopes, eroded	2,423	1.0
MyA	Mudlavia gravelly silt loam, 0 to 2 percent slopes, stony	1,307	0.6
MzB2	Mudlavia cobbly silt loam, 2 to 4 percent slopes, eroded, stony	1,083	0.5
ObB2	Ockley loam, sandy substratum, 2 to 6 percent slopes, eroded	201	0.1
OcA	Ockley silt loam, 0 to 2 percent slopes	677	0.3
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded	825	0.4
OpB	Ormas loamy sand, 1 to 4 percent slopes	407	0.2

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
OsA	Oshtemo coarse sandy loam, 0 to 2 percent slopes	465	0.2
OsB	Oshtemo coarse sandy loam, 2 to 6 percent slopes	657	0.3
Pm	Peotone silty clay loam, pothole	2,251	1.0
Po	Piankeshaw Variant gravelly silt loam, rarely flooded	200	0.1
Pp	Pits, gravel	67	*
PrA	Proctor silt loam, 0 to 2 percent slopes	546	0.2
PrB2	Proctor silt loam, 2 to 6 percent slopes, eroded	416	0.2
PuA	Proctor silt loam, till substratum, 0 to 2 percent slopes	2,227	1.0
PuB2	Proctor silt loam, till substratum, 2 to 6 percent slopes, eroded	1,374	0.6
Rb	Ragsdale silt loam	688	0.3
RdA	Rainsville silt loam, 0 to 2 percent slopes	315	0.1
RfB2	Rainsville-Williamstown-Rockfield silt loams, 2 to 6 percent slopes, eroded	23,273	9.9
RlA	Reesville silt loam, 0 to 2 percent slopes	1,728	0.7
RoA	Rockfield silt loam, 0 to 2 percent slopes	1,489	0.6
RoB2	Rockfield silt loam, 2 to 6 percent slopes, eroded	6,446	2.7
RpG	Rodman gravelly loam, 25 to 60 percent slopes	924	0.4
RtA	Rush silt loam, 0 to 2 percent slopes	724	0.3
RtB2	Rush silt loam, 2 to 6 percent slopes, eroded	252	0.1
Sb	Sable silty clay loam	1,289	0.5
SeA	Shadeland Variant silt loam, 0 to 2 percent slopes	901	0.4
SlA	Starks silt loam, till substratum, 0 to 2 percent slopes	7,744	3.3
Sr	Stonelick-Moundhaven complex, frequently flooded	3,166	1.4
StB3	Strawn clay loam, 2 to 6 percent slopes, severely eroded	200	0.1
StC3	Strawn clay loam, 6 to 12 percent slopes, severely eroded	773	0.3
SyB	Symerton-Varna silt loams, 1 to 3 percent slopes	1,048	0.4
TuC2	Tuscola loam, till substratum, 6 to 12 percent slopes, eroded	232	0.1
TwB2	Tuscola silt loam, till substratum, 2 to 6 percent slopes, eroded	1,098	0.5
Ud	Udorthents, loamy	828	0.4
Ur	Udorthents, loamy, reclaimed	130	0.1
Wc	Wakeland Variant silt loam, occasionally flooded	1,112	0.5
We	Wallkill Variant silty clay loam	318	0.1
Wg	Warners Variant silty clay, drained	225	0.1
Wh	Washtenaw silt loam	1,087	0.5
WlA	Waupecan silt loam, moderately wet, 0 to 2 percent slopes	1,011	0.4
WpG	Weikert Variant fine sandy loam, 35 to 80 percent slopes, very bouldery	856	0.4
WrA	Williamsport-Elliott silt loams, 0 to 2 percent slopes	13,669	5.8
WtC2	Williamstown-Rainsville silt loams, 6 to 12 percent slopes, eroded	4,639	2.0
	Water areas less than 40 acres in size	532	0.2
	Total	234,413	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
AfB2	Alford silt loam, 2 to 6 percent slopes, eroded
Am	Armiesburg Variant silty clay loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
BbA	Barce silt loam, 0 to 2 percent slopes
BdB2	Barce-Montmorenci silt loams, 2 to 6 percent slopes, eroded
Bk	Beckville loam, occasionally flooded
BmB2	Billett sandy loam, 1 to 4 percent slopes, eroded
BoA	Blount silt loam, 0 to 2 percent slopes (where drained)
BrA	Brenton silt loam, 0 to 2 percent slopes (where drained)
BsA	Brenton silt loam, till substratum, 0 to 2 percent slopes (where drained)
BwA	Brenton silt loam, moderately fine substratum, 0 to 2 percent slopes (where drained)
CaB2	Cadiz silt loam, moderately wet, 1 to 6 percent slopes, eroded
CbA	Camden silt loam, 0 to 2 percent slopes
CbB2	Camden silt loam, 2 to 6 percent slopes, eroded
CdB2	Camden silt loam, till substratum, 2 to 6 percent slopes, eroded
CfA	Carmi loam, 0 to 2 percent slopes
Cg	Comfrey loam, stratified substratum, rarely flooded (where drained)
CtB2	Corwin silt loam, 2 to 6 percent slopes, eroded
Cz	Cyclone silty clay loam (where drained)
Dw	Drummer silty clay loams (where drained)
Dx	Drummer silty clay loam, gravelly substratum (where drained)
Dy	Du Page loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
EdB2	Eldean gravelly loam, 2 to 6 percent slopes, eroded
EgA	Eldean silt loam, 0 to 2 percent slopes
EvA	Elston sandy loam, 0 to 3 percent slopes
GgA	Gilboa silt loam, 0 to 2 percent slopes (where drained)
GhB2	Glenhall silt loam, 1 to 4 percent slopes, eroded
GkB2	Glenhall silt loam, till substratum, 1 to 4 percent slopes, eroded
HhB2	High Gap Variant loam, 2 to 6 percent slopes, eroded
IoB2	Iona silt loam, 1 to 4 percent slopes, eroded
IpA	Ipava silt loam, 0 to 2 percent slopes (where drained)
Ju	Jules silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
LcA	Lafayette silt loam, 0 to 2 percent slopes (where drained)
Ld	La Hogue silt loam, 0 to 2 percent slopes (where drained)
Lk	La Hogue silt loam, till substratum, 0 to 2 percent slopes (where drained)
Lp	Landes-Chatterton complex, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
McB2	Markham-Symerton silt loams, 2 to 6 percent slopes, eroded
MdA	Martinsville loam, 0 to 2 percent slopes
MdB2	Martinsville loam, 2 to 6 percent slopes, eroded
MtA	Millbrook silt loam, till substratum, 0 to 2 percent slopes (where drained)
ObB2	Ockley loam, sandy substratum, 2 to 6 percent slopes, eroded
OcA	Ockley silt loam, 0 to 2 percent slopes
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded
OsA	Oshtemo coarse sandy loam, 0 to 2 percent slopes
OsB	Oshtemo coarse sandy loam, 2 to 6 percent slopes
PrA	Proctor silt loam, 0 to 2 percent slopes
PrB2	Proctor silt loam, 2 to 6 percent slopes, eroded
PuA	Proctor silt loam, till substratum, 0 to 2 percent slopes
PuB2	Proctor silt loam, till substratum, 2 to 6 percent slopes, eroded
Rb	Ragsdale silt loam (where drained)
RdA	Rainsville silt loam, 0 to 2 percent slopes
RfB2	Rainsville-Williamstown-Rockfield silt loams, 2 to 6 percent slopes, eroded
RlA	Reesville silt loam, 0 to 2 percent slopes (where drained)
RoA	Rockfield silt loam, 0 to 2 percent slopes
RoB2	Rockfield silt loam, 2 to 6 percent slopes, eroded
RtA	Rush silt loam, 0 to 2 percent slopes
RtB2	Rush silt loam, 2 to 6 percent slopes, eroded

TABLE 5.--PRIME FARMLAND--Continued

Map symbol	Soil name
Sb	Sable silty clay loam (where drained)
SeA	Shadeland Variant silt loam, 0 to 2 percent slopes (where drained)
SlA	Starks silt loam, till substratum, 0 to 2 percent slopes (where drained)
Sr	Stonelick-Moundhaven complex, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
SyB	Symerton-Varna silt loams, 1 to 3 percent slopes
TwB2	Tuscola silt loam, till substratum, 2 to 6 percent slopes, eroded
Wc	Wakeland Variant silt loam, occasionally flooded (where drained)
Wh	Washtenaw silt loam (where drained)
WlA	Waupecan silt loam, moderately wet, 0 to 2 percent slopes
WrA	Williamsport-Elliott silt loams, 0 to 2 percent slopes (where drained)

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	Orchard-grass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
AfB2----------------------- Alford	IIe	120	42	48	4.0	8.0
Am------------------------- Armiesburg Variant	IIw	95	33	---	3.2	6.4
BbA------------------------ Barce	I	125	44	56	4.5	9.0
BdB2----------------------- Barce-Montmorenci	IIe	116	40	52	4.0	8.0
Be------------------------- Beaucoup	Vw	---	---	---	---	---
Bk------------------------- Beckville	IIw	90	32	---	3.0	6.0
BmB2----------------------- Billett	IIIe	75	27	30	2.5	5.0
BnC2----------------------- Billett	IIIe	60	21	24	2.0	4.0
BoA------------------------ Blount	IIw	105	37	48	3.5	7.0
BpD2----------------------- Boyer-Mudlavia	VIe	---	---	21	1.4	2.8
BrA------------------------ Brenton	IIw	140	49	56	4.6	9.2
BsA, BwA------------------- Brenton	IIw	140	49	56	4.6	9.2
CaB2----------------------- Cadiz	IIe	115	40	52	3.8	7.6
CbA------------------------ Camden	I	120	42	48	4.0	8.0
CbB2----------------------- Camden	IIe	115	40	46	3.8	7.6
CdB2----------------------- Camden	IIe	115	40	46	3.8	7.6
CfA------------------------ Carmi	IIs	80	28	40	2.6	5.2
Cg------------------------- Comfrey	IIw	145	51	58	4.8	9.6
Cs------------------------- Comfrey	Vw	---	---	---	---	---

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	Orchard-grass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
CtB2 Corwin	IIe	115	40	52	3.8	7.6
Cz Cyclone	IIw	155	54	62	5.1	10.2
Dw Drummer	IIw	155	54	62	5.1	10.2
Dx Drummer	IIw	146	51	58	4.8	9.6
Dy Du Page	IIw	115	40	---	3.8	7.6
EdB2 Eldean	IIe	55	19	28	1.8	3.6
EgA Eldean	IIs	65	23	33	2.1	4.2
EvA Elston	IIs	65	23	33	2.1	4.2
GgA Gilboa	IIw	135	47	61	4.8	9.6
GhB2 Glenhall	IIe	125	44	50	4.1	8.2
GkB2 Glenhall	IIe	120	42	48	4.0	8.0
GoF Gosport	VIIe	---	---	---	---	1.0
HeG Hennepin	VIIe	---	---	---	---	---
HfB High Gap	IIe	80	28	32	2.6	5.2
HhB2 High Gap Variant	IIe	80	28	32	2.6	5.2
HhC2 High Gap Variant	IIIe	70	25	28	2.3	4.6
Hm Houghton	IIIw	118	41	---	---	---
Ho Houghton	Vw	---	---	---	---	---
IoB2 Iona	IIe	120	42	48	4.0	8.0
IpA Ipava	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	Orchard-grass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Ju----------------------- Jules	IIw	100	35	---	3.3	6.6
LcA---------------------- Lafayette	IIw	140	49	55	4.6	9.2
Ld----------------------- La Hogue	IIw	135	47	54	4.5	9.0
Lk----------------------- La Hogue	IIw	135	47	54	4.5	9.0
Lp----------------------- Landes-Chatterton	IIIw	64	22	29	2.1	4.2
MaB3--------------------- Markham	IIIe	90	32	41	3.0	6.0
McB2--------------------- Markham-Symerton	IIe	107	37	48	3.5	7.0
MdA---------------------- Martinsville	I	120	42	48	4.0	8.0
MdB2--------------------- Martinsville	IIe	115	40	46	3.8	7.6
MdC2--------------------- Martinsville	IIIe	105	37	42	3.4	6.8
MoE2--------------------- Miami	VIe	---	---	---	---	4.6
MpC3--------------------- Miami	IVe	90	32	40	3.0	6.0
MpD3--------------------- Miami	VIe	---	---	---	---	5.0
Mr----------------------- Milford	IVw	65	23	29	2.1	4.2
MtA---------------------- Millbrook	IIw	135	47	54	4.4	8.8
MuC2--------------------- Montmorenci-Barce	IIIe	104	36	47	3.5	7.0
MvE2--------------------- Morley	VIe	---	---	---	3.1	6.2
MwC3--------------------- Morley	IVe	75	26	34	2.5	5.0
MxC2--------------------- Morley-Cadiz	IIIe	93	33	42	3.1	6.2
MyA---------------------- Mudlavia	IIIs	75	26	30	2.5	5.0

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	Orchard-grass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
MzB2---------------------- Mudlavia	IVe	65	24	26	2.1	4.2
ObB2---------------------- Ockley	IIe	105	37	42	3.4	6.8
OcA----------------------- Ockley	I	110	38	44	3.6	7.2
OcB2---------------------- Ockley	IIe	105	37	42	3.4	6.8
OpB----------------------- Ormas	IIIs	75	26	34	2.5	5.0
OsA----------------------- Oshtemo	IIIs	80	28	36	2.6	5.2
OsB----------------------- Oshtemo	IIIe	80	28	36	2.6	5.2
Pm------------------------ Peotone	IVw	65	23	29	2.1	4.2
Po------------------------ Piankeshaw Variant	IVs	75	26	30	2.5	5.0
Pp**. Pits						
PrA----------------------- Proctor	I	130	46	52	4.3	8.6
PrB2---------------------- Proctor	IIe	125	44	50	4.1	8.2
PuA----------------------- Proctor	I	130	46	52	4.3	8.6
PuB2---------------------- Proctor	IIe	125	44	50	4.1	8.2
Rb------------------------ Ragsdale	IIw	155	54	62	5.1	10.2
RdA----------------------- Rainsville	I	120	42	54	4.0	8.0
RfB2---------------------- Rainsville-Williamstown-Rockfield	IIe	113	39	50	3.7	7.4
RlA----------------------- Reesville	IIw	135	47	54	4.5	9.0
RoA----------------------- Rockfield	I	120	42	48	4.0	8.0
RoB2---------------------- Rockfield	IIe	115	40	46	3.8	7.6

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchard-grass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
RpG---------------------- Rodman	VIIs	---	---	---	---	0.2
RtA---------------------- Rush	I	120	42	48	4.0	8.0
RtB2--------------------- Rush	IIe	115	40	46	3.8	7.6
Sb----------------------- Sable	IIw	155	54	62	5.1	10.2
SeA---------------------- Shadeland Variant	IIw	80	28	36	2.6	5.2
SlA---------------------- Starks	IIw	130	46	52	4.3	8.6
Sr----------------------- Stonelick-Moundhaven	IIIw	63	22	29	2.1	4.2
StB3--------------------- Strawn	IIIe	100	35	45	3.3	6.6
StC3--------------------- Strawn	IVe	90	32	41	3.0	6.0
SyB---------------------- Symerton-Varna	IIe	121	42	54	4.0	8.0
TuC2--------------------- Tuscola	IIIe	100	35	40	3.3	6.6
TwB2--------------------- Tuscola	IIe	110	38	44	3.6	7.2
Ud**, Ur**. Udorthents						
Wc----------------------- Wakeland Variant	IIw	125	44	50	4.1	8.2
We----------------------- Wallkill Variant	IIIw	115	40	46	3.8	7.6
Wg----------------------- Warners Variant	IIIw	105	37	42	3.5	7.0
Wh----------------------- Washtenaw	IIw	135	47	54	4.5	9.0
WlA---------------------- Waupecan	I	120	42	48	4.0	8.0
WpG---------------------- Weikert Variant	VIIe	---	---	---	---	---
WrA---------------------- Williamsport-Elliott	IIw	123	43	51	4.1	8.2

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	Orchard-grass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
WtC2---------------------- Williamstown-Rainsville	IIIe	102	36	46	3.4	6.8

* 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	9,137	---	---	---	---
II	178,293	74,645	102,448	1,200	---
III	21,522	9,933	9,410	2,179	---
IV	8,920	8,720	---	200	---
V	3,310	---	3,310	---	---
VI	3,776	3,776	---	---	---
VII	7,898	6,974	---	924	---
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: 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
AfB2 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.
Am Armiesburg Variant	8A	Slight	Slight	Slight	Slight	Yellow poplar White oak Black walnut	100 90 70	107 72 ---	Eastern white pine, black walnut, yellow poplar.
Be Beaucoup	5W	Slight	Severe	Moderate	Moderate	Pin oak Eastern cottonwood Sweetgum Cherrybark oak American sycamore	90 100 --- --- ---	72 128 --- --- ---	Eastern cottonwood, red maple, American sycamore, pin oak.
Bk Beckville	7A	Slight	Slight	Slight	Slight	Yellow poplar White ash Eastern cottonwood Black walnut	95 --- --- ---	98 --- --- ---	Eastern white pine, yellow poplar, black walnut.
BmB2 Billett	4A	Slight	Slight	Slight	Slight	Northern red oak White oak Black oak Northern pin oak Shagbark hickory	60 --- --- --- ---	43 --- --- --- ---	Red pine, eastern white pine, white spruce.
BnC2 Billett	4A	Slight	Slight	Slight	Slight	Black oak White oak Scarlet oak	70 70 70	52 52 52	Eastern white pine, eastern redcedar, red pine.
BoA Blount	3C	Slight	Slight	Severe	Severe	White oak Northern red oak Green ash Bur oak Pin oak	65 65 --- --- ---	48 48 --- --- ---	Eastern white pine, eastern redcedar, red pine, yellow poplar.
BpD2**:									
Boyer	4A	Slight	Slight	Slight	Slight	White oak Red pine Eastern white pine Jack pine Northern red oak	70 75 65 68 75	52 142 136 100 57	Eastern white pine, red pine, jack pine.
Mudlavia	4A	Slight	Slight	Slight	Slight	White oak Yellow poplar Northern red oak Shagbark hickory	80 88 80 ---	62 86 62 ---	White oak, yellow poplar, northern red oak, white ash, green ash, eastern white pine, red pine, black cherry.

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
CaB2------------ Cadiz	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- American basswood--- Black cherry-------- Shagbark hickory----	65 --- --- --- ---	48 --- --- --- ---	Eastern white pine, red pine, white spruce, black walnut.
CbA, CbB2------- 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 75	White oak, black walnut, green ash, eastern white pine, red pine, yellow poplar, white ash.
CdB2------------ Camden	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, green ash, eastern white pine, red pine, yellow poplar, white ash.
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.
EdB2, EgA------- Eldean	4A	Slight	Slight	Slight	Slight	Northern red oak---- Black oak----------- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow poplar-------	80 80 80 --- --- --- --- ---	62 62 62 --- --- --- --- ---	Eastern white pine, black walnut, yellow poplar, white ash, red pine, white oak.
GoF------------- Gosport	2R	Severe	Severe	Severe	Severe	White oak-----------	45	30	Eastern white pine, red pine, yellow poplar.
HeG------------- 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.
HfB------------- High Gap	4D	Slight	Slight	Slight	Moderate	White oak----------- Yellow poplar------- Virginia pine-------	75 75 55	57 62 80	Eastern white pine, red pine, Virginia pine.

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
HhB2, HhC2------ High Gap Variant	6A	Slight	Slight	Slight	Slight	Yellow poplar-------	85	81	Yellow poplar, eastern white pine.
Hm, Ho---------- Houghton	2W	Slight	Severe	Severe	Severe	White ash-----------	51	35	
						Red maple-----------	51	33	
						Black willow--------	---	---	
						Quaking aspen-------	56	56	
						Silver maple--------	76	30	
IoB2------------ Iona	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	
Lp**:									
Landes---------	7A	Slight	Slight	Slight	Slight	Yellow poplar-------	95	98	Eastern cottonwood, yellow poplar, American sycamore, green ash, black walnut, eastern white pine, sugar maple.
						Eastern cottonwood--	105	141	
						American sycamore---	---	---	
						Sweetgum------------	---	---	
						Green ash-----------	---	---	
Chatterton-----	6A	Slight	Slight	Slight	Slight	Yellow poplar-------	90	90	Black walnut.
MaB3------------ Markham	4A	Slight	Slight	Slight	Slight	White oak-----------	80	62	White oak, black walnut, northern red oak, green ash, sugar maple, eastern white pine.
						Northern red oak----	80	62	
						Yellow poplar-------	90	90	
						Black walnut--------	---	---	
McB2**:									
Markham--------	4A	Slight	Slight	Slight	Slight	White oak-----------	80	62	White oak, black walnut, northern red oak, green ash, sugar maple, eastern white pine.
						Northern red oak----	80	62	
						Yellow poplar-------	90	90	
						Black walnut--------	---	---	
Symerton.									
MdA, MdB2, MdC2- Martinsville	4A	Slight	Slight	Slight	Slight	White oak-----------	80	62	Eastern white pine, red pine, white ash, yellow poplar, black walnut.
						Yellow poplar-------	98	104	
						Sweetgum------------	76	70	

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
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.
MtA-------------- 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.
MvE2------------ Morley	4R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak---- Yellow poplar------- Black walnut-------- Bur oak------------- Shagbark hickory----	80 80 90 --- --- ---	62 62 90 --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine, white spruce.
MwC3------------ Morley	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow poplar------- Black walnut-------- Bur oak------------- Shagbark hickory----	80 80 90 --- --- ---	62 62 90 --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine, white spruce.
MxC2**:									
Morley----------	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow poplar------- Black walnut-------- Bur oak------------- Shagbark hickory----	80 80 90 --- --- ---	62 62 90 --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine, white spruce.
Cadiz-----------	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- American basswood--- Black cherry-------- Shagbark hickory----	65 --- --- --- ---	48 --- --- --- ---	Eastern white pine, red pine, white spruce, 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
MyA, MzB2: Mudlavia	4A	Slight	Slight	Slight	Slight	White oak	80	62	White oak, yellow poplar, northern red oak, white ash, green ash, eastern white pine, red pine, black cherry.
						Yellow poplar	88	86	
						Northern red oak	80	62	
						Shagbark hickory	---	---	
ObB2: 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	
OcA, OcB2: Ockley	5A	Slight	Slight	Slight	Slight	White oak	90	72	Eastern white pine, red pine, white ash, yellow poplar, black walnut.
						Northern red oak	90	72	
						Yellow poplar	98	104	
						Sweetgum	76	70	
OpB: Ormas	4S	Slight	Slight	Moderate	Slight	White oak	70	52	Eastern white pine, red pine, yellow poplar, black walnut, European alder.
						Yellow poplar	---	---	
						Eastern white pine	---	---	
						Red pine	78	150	
OsA, OsB: Oshtemo	4A	Slight	Slight	Slight	Slight	White oak	70	52	Eastern white pine, red pine, jack pine.
						Red pine	78	150	
						Eastern white pine	85	196	
						Jack pine	68	100	
Po: Piankeshaw Variant	3F	Slight	Moderate	Severe	Slight	Sugar maple	60	38	Green ash, eastern white pine, yellow poplar, American sycamore.
						Black walnut	---	---	
						American sycamore	---	---	
						Hackberry	---	---	
Rb: Ragsdale	5W	Slight	Severe	Severe	Severe	Pin oak	90	72	Eastern white pine, red maple, white ash.
						White oak	75	57	
						Sweetgum	90	106	
RdA: Rainsville	5A	Slight	Slight	Slight	Slight	White oak	88	70	White oak, yellow poplar, northern red oak, white ash, green ash, eastern white pine, black cherry, black walnut.
						Yellow poplar	98	104	
						Northern red oak	90	72	
						Shagbark hickory	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Common trees	Site index	Volume*	
RfB2**:									
Rainsville	5A	Slight	Slight	Slight	Slight	White oak	88	70	White oak, yellow poplar, northern red oak, white ash, green ash, eastern white pine, black cherry, black walnut.
						Yellow poplar	98	104	
						Northern red oak	90	72	
						Shagbark hickory	---	---	
Williamstown	5A	Slight	Slight	Slight	Slight	White oak	85	67	Black walnut, white oak, yellow poplar.
						Yellow poplar	100	107	
						White ash	85	88	
Rockfield	8A	Slight	Slight	Slight	Slight	Yellow poplar	105	115	Eastern white pine, yellow poplar, white oak, black walnut, green ash, white ash.
						White ash	85	88	
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, eastern cottonwood, American sycamore.
						Yellow poplar	86	82	
						Sugar maple	90	55	
						Green ash	---	---	
						Swamp white oak	---	---	
						Black cherry	---	---	
						Red maple	---	---	
						Pin oak	---	---	
						Eastern cottonwood	---	---	
RoA, RoB2 Rockfield	8A	Slight	Slight	Slight	Slight	Yellow poplar	105	115	Eastern white pine, yellow poplar, white oak, black walnut, green ash, white ash.
						White ash	85	88	
RpG Rodman	4R	Severe	Severe	Severe	Slight	Northern red oak	70	51	Eastern white pine, red pine, jack pine.
						White oak	70	52	
						Red pine	75	142	
						Eastern white pine	85	196	
RtA, RtB2 Rush	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	---	---	
SeA Shadeland Variant	6A	Slight	Moderate	Slight	Slight	Yellow poplar	85	81	Eastern white pine, white ash, yellow poplar, swamp white oak, pin oak.
						Pin oak	---	---	
						Swamp white oak	---	---	
						American sycamore	---	---	

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
SlA------------ Starks	5A	Slight	Slight	Slight	Slight	Yellow poplar-------	80	71	Yellow poplar, sugar maple, white oak, green ash.
						White oak-----------	81	63	
						Black oak-----------	89	71	
						Northern red oak----	92	74	
Sr**:									
Stonelick------	4A	Slight	Slight	Slight	Slight	Northern red oak----	80	62	Eastern white pine, black walnut, yellow poplar, white ash, red pine, white oak.
						Yellow poplar-------	95	98	
						White oak-----------	---	---	
						Black walnut--------	---	---	
						Black cherry--------	---	---	
						Sugar maple---------	---	---	
						White ash-----------	---	---	
Moundhaven-----	4S	Slight	Slight	Moderate	Severe	Northern red oak----	78	60	Black walnut, black oak, yellow poplar, red pine.
						White oak-----------	---	---	
						Yellow poplar-------	---	---	
StB3, StC3------ Strawn	4A	Slight	Slight	Slight	Slight	White oak-----------	80	62	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
						Northern red oak----	80	62	
						Yellow poplar-------	90	90	
						Black walnut--------	---	---	
TuC2, TwB2------ Tuscola	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Eastern white pine, white ash, yellow poplar, black walnut.
						Northern red oak----	90	72	
						Yellow poplar-------	98	104	
Wc-------------- Wakeland Variant	5A	Slight	Slight	Slight	Slight	White ash-----------	70	66	Pin oak, red maple, yellow poplar.
						Bur oak-------------	---	---	
						American basswood---	---	---	
						Hackberry-----------	---	---	
						Cottonwood----------	---	---	
						American elm--------	---	---	
						American sycamore---	---	---	
						Honeylocust---------	---	---	
Wh-------------- Washtenaw	5W	Slight	Severe	Severe	Moderate	Pin oak-------------	86	68	Eastern white pine, black spruce, 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-----------	---	---	
WpG------------- Weikert Variant	6R	Severe	Severe	Slight	Moderate	Yellow poplar-------	89	88	Yellow poplar, black oak, eastern white pine, northern red oak, red pine.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Common trees	Site index	Volume*	
WtC2**:									
Williamstown---	5A	Slight	Slight	Slight	Slight	White oak----------- Yellow poplar------- White ash-----------	85 100 85	67 107 88	Black walnut, white oak, yellow poplar.
Rainsville-----	5A	Slight	Slight	Slight	Slight	White oak----------- Yellow poplar------- Northern red oak---- Shagbark hickory----	88 98 90 ---	70 104 72 ---	White oak, yellow poplar, northern red oak, white ash, green ash, eastern white pine, black cherry, black walnut.

* 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
AfB2: 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.
Am: Armiesburg 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, imperial Carolina poplar.
BbA: Barce	---	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, imperial Carolina poplar.
BdB2*:					
Barce	---	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.
Montmorenci	---	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.
Be: Beaucoup	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Bk: 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, imperial Carolina poplar.
BmB2: Billett	Lilac	Russian olive, Siberian peashrub, eastern redcedar.	Eastern white pine, honeylocust, hackberry, red pine, Norway spruce, green ash, Amur maple.	---	---

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
BnC2: Billett	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush.	Austrian pine, northern white-cedar, Osageorange, eastern redcedar.	Eastern white pine, Norway spruce, red pine.	---
BoA: Blount	---	American cranberrybush, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	Imperial Carolina poplar.
BpD2*:					
Boyer	Siberian peashrub	Amur honeysuckle, lilac, Washington hawthorn, radiant crabapple, autumn olive, eastern redcedar.	Eastern white pine, red pine, Austrian pine, jack pine.	---	---
Mudlavia	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red 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, imperial Carolina poplar.
BsA, BwA: Brenton	---	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, imperial Carolina poplar.
CaB2: Cadiz	---	Northern white-cedar, lilac, gray dogwood, Amur maple, American cranberrybush.	Norway spruce, Black Hills spruce, white spruce.	Eastern white pine, red pine, white ash, red maple.	---

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
CbA, CbB2: 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, imperial Carolina poplar.
CdB2: Camden	---	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.
CfA: Carmi	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Cg, Cs: Comfrey	---	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, imperial Carolina poplar.
CtB2: Corwin	---	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.
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, imperial Carolina poplar.
Dw*:					
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, imperial Carolina poplar.
Drummer, stratified sandy substratum	---	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, imperial Carolina poplar.

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
Dx: Drummer	---	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, imperial Carolina poplar.
Dy: Du Page	---	Siberian peashrub	Green ash, Osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	Imperial Carolina poplar.
EdB2, EgA: Eldean	Siberian peashrub	Autumn olive, eastern redcedar, radiant crabapple, Washington hawthorn, Amur honeysuckle, lilac.	Austrian pine, eastern white pine, jack pine, red pine.	---	---
EvA: Elston	---	Amur honeysuckle, Amur privet, American cranberrybush, Washington hawthorn.	Austrian pine, eastern redcedar, northern white-cedar, Osageorange.	Eastern white pine, Norway spruce, red pine.	---
GgA: Gilboa	---	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, imperial Carolina poplar.
GhB2, GkB2: Glenhall	---	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.
GoF: Gosport	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, silky dogwood, American cranberrybush.	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
HeG: Hennepin	Siberian peashrub	Eastern redcedar, Osageorange, Russian olive, jack pine, Washington hawthorn, gray dogwood, silky dogwood, Amur privet, American cranberrybush.	Honeylocust, northern catalpa.	---	---
HfB: High Gap	Siberian peashrub	Amur honeysuckle, lilac, autumn olive, eastern redcedar, radiant crabapple, Washington hawthorn.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
HhB2, HhC2: High Gap Variant	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Hm: Houghton	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
Ho: Houghton	---	---	---	---	---
IoB2: Iona	---	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.
IpA: Ipava	---	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, imperial Carolina poplar.

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
Ju----------------- Jules	---	Siberian peashrub, silky dogwood.	Green ash, Osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow------	Imperial Carolina poplar.
LcA--------------- Lafayette	---	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, imperial Carolina poplar.
Ld---------------- La Hogue	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine, imperial Carolina poplar.
Lk---------------- La Hogue	---	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, imperial Carolina poplar.
Lp*:					
Landes-----------	---	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.
Chatterton-------	---	Autumn olive, eastern redcedar, Washington hawthorn, Amur honeysuckle, lilac.	Eastern white pine, green ash, Austrian pine, red pine, jack pine, thornless honeylocust.	---	---
MaB3-------------- Markham	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	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
McB2*:					
Markham	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
Symerton	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
MdA, MdB2, MdC2 Martinsville	---	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, imperial Carolina poplar.
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.
Mr 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.
MtA Millbrook	---	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, imperial Carolina poplar.
MuC2*:					
Montmorenci	---	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.
Barce	---	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
MvE2, MwC3 Morley	---	American cranberrybush, silky dogwood, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
MxC2*:					
Morley	---	American cranberrybush, silky dogwood, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
Cadiz	---	Northern white-cedar, lilac, gray dogwood, Amur maple, American cranberrybush.	Norway spruce, Black Hills spruce, white spruce.	Eastern white pine, red pine, white ash, red maple.	---
MyA, MzB2 Mudlavia	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
ObB2 Ockley	---	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.
OcA, OcB2 Ockley	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak, imperial Carolina poplar.
OpB Ormas	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn olive, Washington hawthorn, Amur honeysuckle.	Red pine, Austrian pine, jack pine.	Eastern white pine	---

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
OsA, OsB----------Oshtemo	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn olive, Washington hawthorn, Amur honeysuckle.	Eastern white pine, red pine, Austrian pine, jack pine.	---	---
Pm----------------Peotone	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Po----------------Piankeshaw Variant	---	Siberian peashrub	Green ash, Osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow------	---
Pp*. Pits					
PrA, PrB2---------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, imperial Carolina poplar.
PuA, PuB2---------Proctor	---	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.
Rb----------------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, imperial Carolina poplar.
RdA---------------Rainsville	---	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, imperial Carolina poplar.
RfB2*: Rainsville-------	---	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
RfB2*:					
Williamstown	---	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.
Rockfield	Silky dogwood	Amur honeysuckle, American cranberrybush, Amur privet.	Austrian pine, northern white-cedar, white fir, Washington hawthorn, blue spruce.	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, imperial Carolina poplar.
RoA, RoB2 Rockfield	Silky dogwood	Amur honeysuckle, American cranberrybush, Amur privet.	Austrian pine, northern white-cedar, white fir, Washington hawthorn, blue spruce.	Norway spruce	Eastern white pine, pin oak, imperial Carolina poplar.
RpG Rodman	Siberian peashrub	Silky dogwood, gray dogwood, Amur honeysuckle, autumn olive, Washington hawthorn, radiant crabapple, eastern redcedar.	Jack pine, Virginia pine, black locust, Austrian pine.	---	---
RtA, RtB2 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, imperial Carolina poplar.
Sb Sable	---	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, imperial Carolina poplar.
SeA Shadeland 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, imperial Carolina poplar.

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
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, imperial Carolina poplar.
Sr*:					
Stonelick	---	Siberian peashrub	Green ash, eastern redcedar, Osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow	---
Moundhaven	---	Siberian peashrub	Green ash, Washington hawthorn, northern white-cedar, nannyberry viburnum, Osageorange, white spruce, eastern redcedar.	---	---
StB3, StC3: Strawn	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
SyB*:					
Symerton	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Varna	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, arrowwood, silky dogwood, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
TuC2, TwB2: Tuscola	---	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.
Ud*, Ur*. Udorthents					

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
Wc-----Wakeland 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, imperial Carolina poplar.
We-----Wallkill Variant	---	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.
Wg-----Warners Variant	---	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.
Wh-----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, imperial Carolina poplar.
WlA-----Waupecan	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine, imperial Carolina poplar.
WpG-----Weikert Variant	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
WrA*:					
Williamsport-----	---	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, imperial Carolina poplar.
Elliott----------	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak, imperial Carolina poplar.

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
WtC2*: Williamstown-----	---	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.
Rainsville-------	---	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 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
AfB2 Alford	Slight	Slight	Moderate: slope.	Slight	Slight.
Am Armiesburg Variant	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
BbA Barce	Slight	Slight	Slight	Slight	Slight.
BdB2*:					
Barce	Slight	Slight	Moderate: slope.	Slight	Slight.
Montmorenci	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
Be Beaucoup	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Bk Beckville	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
BmB2 Billett	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
BnC2 Billett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
BoA Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
BpD2*:					
Boyer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, droughty.
Mudlavia	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope, small stones.	Moderate: large stones.	Severe: large stones, droughty.
BrA, BsA, BwA Brenton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CaB2 Cadiz	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
CbA Camden	Slight	Slight	Slight	Slight	Slight.

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
CbB2, CdB2------------ Camden	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
CfA------------------- Carmi	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
Cg-------------------- Comfrey	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Cs-------------------- Comfrey	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
CtB2------------------ Corwin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
Cz-------------------- Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dw*:					
Drummer---------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Drummer, stratified sandy substratum----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dx-------------------- Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dy-------------------- Du Page	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
EdB2------------------ Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Severe: small stones.	Slight----------	Moderate: droughty.
EgA------------------- Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones.	Slight----------	Moderate: droughty.
EvA------------------- Elston	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
GgA------------------- Gilboa	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
GhB2, GkB2------------ Glenhall	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
GoF------------------- Gosport	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
HeG------------------- Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: 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
HfB------------------- High Gap	Slight----------	Slight----------	Moderate: slope, thin layer, area reclaim.	Slight----------	Moderate: thin layer, area reclaim.
HhB2------------------ High Gap Variant	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, thin layer.	Slight----------	Moderate: thin layer, area reclaim.
HhC2------------------ High Gap Variant	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.
Hm, Ho---------------- Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
IoB2------------------ Iona	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
IpA------------------- Ipava	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ju-------------------- Jules	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
LcA------------------- Lafayette	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ld, Lk---------------- La Hogue	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Lp*:					
Landes-----------------	Severe: flooding.	Moderate: flooding.	Slight----------	Moderate: flooding.	Severe: flooding.
Chatterton------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
MaB3------------------ Markham	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
McB2*:					
Markham---------------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
Symerton--------------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
MdA------------------- Martinsville	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.

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
MdB2------------------ Martinsville	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
MdC2------------------ Martinsville	Moderate: slope.	Moderate: slope.	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.
Mr-------------------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MtA------------------- Millbrook	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
MuC2*:					
Montmorenci----------	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
Barce----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
MvE2------------------ Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MwC3------------------ Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MxC2*:					
Morley---------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Cadiz----------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MyA------------------- Mudlavia	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Severe: droughty.
MzB2------------------ Mudlavia	Moderate: large stones, small stones.	Moderate: large stones, small stones.	Severe: large stones, small stones.	Moderate: large stones.	Severe: large stones, droughty.
ObB2------------------ Ockley	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
OcA------------------- Ockley	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.

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
OcB2 Ockley	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
OpB Ormas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
OsA Oshtemo	Slight	Slight	Moderate: small stones.	Slight	Slight.
OsB Oshtemo	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Pm Peotone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Po Piankeshaw Variant	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight	Severe: droughty.
Pp*. Pits					
PrA Proctor	Slight	Slight	Slight	Slight	Slight.
PrB2 Proctor	Slight	Slight	Moderate: slope.	Slight	Slight.
PuA Proctor	Slight	Slight	Slight	Slight	Slight.
PuB2 Proctor	Slight	Slight	Moderate: slope.	Slight	Slight.
Rb Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RdA Rainsville	Slight	Slight	Slight	Slight	Slight.
RfB2*:					
Rainsville	Slight	Slight	Moderate: slope.	Slight	Slight.
Williamstown	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Rockfield	Slight	Slight	Moderate: slope.	Slight	Slight.
RlA Reesville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RoA Rockfield	Slight	Slight	Slight	Slight	Slight.

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
RoB2------------------- Rockfield	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
RpG------------------- Rodman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RtA------------------- Rush	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
RtB2------------------- Rush	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Sb------------------- Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
SeA------------------- Shadeland Variant	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, thin layer, area reclaim.
SlA------------------- Starks	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Sr*: Stonelick------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Moundhaven-----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
StB3------------------- Strawn	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight----------	Slight.
StC3------------------- Strawn	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
SyB*: Symerton------------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
Varna----------------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
TuC2------------------- Tuscola	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
TwB2------------------- Tuscola	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight----------	Slight.
Ud*, Ur*. Udorthents					

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
Wc------------------- Wakeland Variant	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
We------------------- Wallkill Variant	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wg------------------- Warners Variant	Severe: ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
Wh------------------- Washtenaw	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
WlA------------------ Waupecan	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
WpG------------------ Weikert Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WrA*:					
Williamsport---------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Elliott--------------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
WtC2*:					
Williamstown---------	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
Rainsville-----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

* 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
AfB2: Alford	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Am: Armiesburg Variant	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
BbA: Barce	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BdB2*:										
Barce	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Montmorenci	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Be: Beaucoup	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Bk: Beckville	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
BmB2: Billett	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BnC2: Billett	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BoA: Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BpD2*:										
Boyer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mudlavia	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
BrA: Brenton	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BsA, BwA: Brenton	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CaB2: Cadiz	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CbA, CbB2: Camden	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CdB2: Camden	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CfA: Carmi	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Cg----------------- Comfrey	Fair	Fair	Poor	Fair	Poor	Good	Good	Fair	Fair	Good.
Cs----------------- Comfrey	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
CtB2--------------- Corwin	Good	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
Cz----------------- Cyclone	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Dw*:										
Drummer-----------	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Drummer, stratified sandy substratum-------	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Dx----------------- Drummer	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
Dy----------------- Du Page	Good	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
EdB2--------------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EgA---------------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EvA---------------- Elston	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GgA---------------- Gilboa	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
GhB2, GkB2--------- Glenhall	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
GoF---------------- Gosport	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
HeG---------------- Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
HfB---------------- High Gap	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HhB2--------------- High Gap Variant	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HhC2--------------- High Gap Variant	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Hm, Ho------------- Houghton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
IoB2 Iona	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
IpA Ipava	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ju Jules	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
LcA Lafayette	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ld La Hogue	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor.
Lk La Hogue	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Lp*:										
Landes	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Chatterton	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
MaB3 Markham	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
McB2*:										
Markham	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Symerton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MdA, MdB2 Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MdC2 Martinsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
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.
Mr Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
MtA Millbrook	Good	Good	Fair	Good	Good	Fair	Fair	Good	Good	Fair.
MuC2*:										
Montmorenci	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Barce	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: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
MvE2: Morley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MwC3: Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MxC2*:										
Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Cadiz	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MyA, MzB2: Mudlavia	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
ObB2, OcA, OcB2: Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OpB: Ormas	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
OsA, OsB: Oshtemo	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pm: Peotone	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Po: Piankeshaw Variant	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
Pp*. Pits										
PrA, PrB2, PuA, PuB2: Proctor	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Rb: Ragsdale	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor.
RdA: Rainsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RfB2*:										
Rainsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Williamstown	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rockfield	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
RlA: Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RoA, RoB2: Rockfield	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
RpG----------------- Rodman	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RtA, RtB2---------- Rush	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sb----------------- Sable	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
SeA---------------- Shadeland Variant	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
SlA---------------- Starks	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Sr*:										
Stonelick----------	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Moundhaven---------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
StB3, StC3--------- Strawn	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SyB*:										
Symerton----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Varna-------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
TuC2--------------- Tuscola	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
TwB2--------------- Tuscola	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ud*, Ur*. Udorthents										
Wc----------------- Wakeland Variant	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
We----------------- Wallkill Variant	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wg----------------- Warners Variant	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wh----------------- Washtenaw	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
WlA---------------- Waupecan	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WpG---------------- Weikert Variant	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	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
WrA*:										
Williamsport	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Fair	Fair.
Elliott	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WtC2*:										
Williamstown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rainsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very 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
AfB2: Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Am: Armiesburg Variant	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
BbA: Barce	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
BdB2*:						
Barce	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
Montmorenci	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
Be: Beaucoup	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
Bk: Beckville	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
BmB2: Billett	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
BnC2: Billett	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
BoA: Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
BpD2*:						
Boyer	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Mudlavia	Severe: cutbanks cave.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Severe: large stones, droughty.
BrA, BsA, BwA: Brenton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

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
CaB2: Cadiz	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
CbA: Camden	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
CbB2: Camden	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
CdB2: Camden	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
CfA: Carmi	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
Cg: Comfrey	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, frost action.	Severe: ponding.
Cs: Comfrey	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding.
CtB2: Corwin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Moderate: shrink-swell, low strength, wetness.	Slight.
Cz: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Dw*:						
Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Drummer, stratified sandy substratum	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Dx: Drummer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding..	Severe: low strength, ponding, frost action.	Severe: ponding.
Dy: Du Page	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.

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
EdB2: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
EgA: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
EvA: Elston	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
GgA: Gilboa	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
GhB2: Glenhall	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: frost action.	Slight.
GkB2: Glenhall	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
GoF: Gosport	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope.
HeG: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HfB: High Gap	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: low strength.	Moderate: thin layer, area reclaim.
HhB2: High Gap Variant	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: thin layer, area reclaim.
HhC2: High Gap Variant	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer, area reclaim.
Hm, Ho: Houghton	Severe: excess humus, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
IoB2: Iona	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
IpA: Ipava	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
Ju: Jules	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.

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
LcA Lafayette	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ld, Lk La Hogue	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Lp*:						
Landes	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Chatterton	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
MaB3 Markham	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
McB2*:						
Markham	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Symerton	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
MdA Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
MdB2 Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
MdC2 Martinsville	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MoE2 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
MpC3 Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
MpD3 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Mr Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
MtA Millbrook	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

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
MuC2*:						
Montmorenci	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
Barce	Moderate: dense layer, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MvE2 Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
MwC3 Morley	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
MxC2*:						
Morley	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Cadiz	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
MyA Mudlavia	Severe: cutbanks cave.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, frost action.	Severe: droughty.
MzB2 Mudlavia	Severe: cutbanks cave.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, frost action.	Severe: large stones, droughty.
ObB2 Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
OcA Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
OcB2 Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
OpB Ormas	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
OsA Oshtemo	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
OsB Oshtemo	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	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
Pm----------------- Peotone	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
Po----------------- Piankeshaw Variant	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action, large stones.	Severe: droughty.
Pp*. Pits						
PrA---------------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
PrB2--------------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
PuA---------------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
PuB2--------------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Rb----------------- Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
RdA---------------- Rainsville	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
RfB2*:						
Rainsville--------	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Williamstown------	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.
Rockfield---------	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
RlA---------------- Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
RoA---------------- Rockfield	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RoB2: Rockfield	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
RpG: Rodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
RtA: Rush	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
RtB2: Rush	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Sb: Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
SeA: Shadeland Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness, thin layer, area reclaim.
SlA: Starks	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Sr*:						
Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Moundhaven	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
StB3: Strawn	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
StC3: Strawn	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
SyB*:						
Symerton	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Varna	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
TuC2: Tuscola	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	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
TwB2---------------- Tuscola	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
Ud*, Ur*. Udorthents						
Wc---------------- Wakeland Variant	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
We---------------- Wallkill Variant	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Wg---------------- Warners Variant	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, too clayey.
Wh---------------- Washtenaw	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
WlA--------------- Waupecan	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
WpG--------------- Weikert Variant	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
WrA*: Williamsport-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Elliott----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
WtC2*: Williamstown-----	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: wetness, slope.
Rainsville-------	Moderate: dense layer, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.

* 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
AfB2 Alford	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Am Armiesburg Variant	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
BbA Barce	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: small stones, wetness.
BdB2*:					
Barce	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: small stones, wetness.
Montmorenci	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Be Beaucoup	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
Bk Beckville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
BmB2 Billett	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
BnC2 Billett	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope. slope.
BoA Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BpD2*:					
Boyer	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Mudlavia	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, too clayey.	Moderate: slope.	Poor: too clayey, small stones.

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
BrA----------------- Brenton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BsA, BwA------------ Brenton	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CaB2---------------- Cadiz	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
CbA----------------- Camden	Slight-----------	Moderate: seepage.	Severe: seepage.	Slight-----------	Fair: too clayey.
CbB2---------------- Camden	Slight-----------	Moderate: seepage, slope.	Severe: seepage.	Slight-----------	Fair: too clayey.
CdB2---------------- Camden	Severe: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
CfA----------------- Carmi	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Cg------------------ Comfrey	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Cs------------------ Comfrey	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
CtB2---------------- Corwin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Cz------------------ Cyclone	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Dw*:					
Drummer-------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Drummer, stratified sandy substratum--	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
Dx------------------ Drummer	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
Dy------------------ Du Page	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EdB2, EgA----------- Eldean	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EvA----------------- Elston	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
GgA----------------- Gilboa	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
GhB2---------------- Glenhall	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
GkB2---------------- Glenhall	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
GoF----------------- Gosport	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: area reclaim, slope, thin layer.
HeG----------------- Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HfB----------------- High Gap	Severe: thin layer, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Moderate: seepage.	Poor: area reclaim, thin layer.
HhB2---------------- High Gap Variant	Severe: thin layer, seepage, wetness.	Severe: seepage, wetness.	Severe: seepage.	Moderate: seepage, wetness.	Poor: area reclaim, thin layer.
HhC2---------------- High Gap Variant	Severe: thin layer, seepage, wetness.	Severe: seepage, slope, wetness.	Severe: seepage.	Moderate: seepage, wetness, slope.	Poor: area reclaim, thin layer.
Hm, Ho-------------- Houghton	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
IoB2---------------- Iona	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
IpA----------------- Ipava	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness.
Ju------------------ Jules	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LcA----- Lafayette	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Ld----- La Hogue	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
Lk----- La Hogue	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Lp*:					
Landes-----	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
Chatterton-----	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
MaB3----- Markham	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
McB2*:					
Markham-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
Symerton-----	Severe: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
MdA----- Martinsville	Slight-----	Severe: seepage.	Severe: seepage.	Slight-----	Fair: thin layer.
MdB2----- Martinsville	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----	Fair: thin layer.
MdC2----- Martinsville	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, thin layer.
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.

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
Mr: Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
MtA: Millbrook	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
MuC2*:					
Montmorenci	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: slope, wetness.
Barce	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: small stones, slope, wetness.
MvE2: Morley	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope.
MwC3: Morley	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: slope.	Fair: too clayey, slope, wetness.
MxC2*:					
Morley	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: slope.	Fair: too clayey, slope, wetness.
Cadiz	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope.
MyA: Mudlavia	Moderate: percs slowly, large stones.	Severe: seepage.	Severe: seepage, too clayey.	Slight	Poor: too clayey, small stones.
MzB2: Mudlavia	Moderate: percs slowly, large stones.	Severe: seepage, large stones.	Severe: seepage, too clayey.	Slight	Poor: too clayey, small stones.
ObB2: Ockley	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, small stones, thin layer.
OcA, OcB2: Ockley	Slight	Severe: seepage.	Severe: seepage.	Slight	Poor: small stones.
OpB: Ormas	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
OsA, OsB: Oshtemo	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.

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
Pm: Peotone	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Po: Piankeshaw Variant	Moderate: flooding, large stones.	Severe: seepage, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: seepage, small stones.
Pp*. Pits					
PrA, PrB2: Proctor	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness.
PuA, PuB2: Proctor	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Rb: Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
RdA: Rainsville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
RfB2*:					
Rainsville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Williamstown	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Rockfield	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
RlA: Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
RoA, RoB2: Rockfield	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
RpG: Rodman	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
RtA: Rush	Slight	Moderate: seepage.	Severe: seepage.	Slight	Fair: too clayey.
RtB2: Rush	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey.

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
Sb------------------- Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: hard to pack, ponding.
SeA----------------- Shadeland Variant	Severe: thin layer, seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: area reclaim, wetness, thin layer.
SlA----------------- Starks	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Sr*: Stonelick----------	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.
Moundhaven---------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
StB3---------------- Strawn	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, small stones.
StC3---------------- Strawn	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
SyB*: Symerton-----------	Severe: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
Varna--------------	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
TuC2---------------- Tuscola	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, wetness.
TwB2---------------- Tuscola	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Ud*, Ur*. Udorthents					
Wc------------------ Wakeland Variant	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, 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
We------------------ Wallkill Variant	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Wg------------------ Warners Variant	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding, too clayey, excess humus.	Severe: ponding.	Poor: hard to pack, ponding.
Wh------------------ Washtenaw	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
WlA----------------- Waupecan	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too clayey, wetness, thin layer.
WpG----------------- Weikert Variant	Severe: thin layer, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
WrA*:					
Williamsport--------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, hard to pack, too clayey.
Elliott-------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
WtC2*:					
Williamstown--------	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Rainsville----------	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, 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
AfB2: Alford	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Am: Armiesburg Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BbA: Barce	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
BdB2*:				
Barce	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Montmorenci	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, small stones.
Be: Beaucoup	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Bk: Beckville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BmB2: Billett	Good	Probable	Improbable: too sandy.	Fair: small stones, area reclaim, thin layer.
BnC2: Billett	Good	Probable	Improbable: too sandy.	Fair: small stones, area reclaim, slope.
BoA: Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BpD2*:				
Boyer	Good	Probable	Probable	Poor: small stones, area reclaim.
Mudlavia	Fair: large stones.	Probable	Probable	Poor: too clayey, small stones, area reclaim.
BrA: Brenton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
BsA, BwA: Brenton	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnotes at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CaB2: Cadiz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
CbA, CbB2: Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CdB2: Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
CfA: Carmi	Good	Probable	Probable	Poor: small stones, area reclaim.
Cg, Cs: Comfrey	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CtB2: Corwin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Cz: Cyclone	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Dw*:				
Drummer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Drummer, stratified sandy substratum	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Dx: Drummer	Poor: wetness.	Probable	Probable	Poor: wetness.
Dy: Du Page	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
EdB2, EgA: Eldean	Good	Probable	Probable	Poor: small stones, area reclaim.
EvA: Elston	Good	Probable	Probable**	Fair: small stones, area reclaim.
GgA: Gilboa	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
GhB2, GkB2: Glenhall	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
GoF: Gosport	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.

See footnotes at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HeG: Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
HfB: High Gap	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
HhB2, HhC2: High Gap Variant	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, thin layer.
Hm, Ho: Houghton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
IoB2: Iona	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
IpA: Ipava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ju: Jules	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
LcA: Lafayette	Fair: wetness.	Probable	Probable	Fair: too clayey, area reclaim.
Ld, Lk: La Hogue	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lp*:				
Landes	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, thin layer.
Chatterton	Good	Probable	Improbable: too sandy.	Fair: area reclaim, too sandy, small stones.
MaB3: Markham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
McB2*:				
Markham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Symerton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MdA: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnotes at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MdB2: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
MdC2: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, 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, too clayey.
MpD3: Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mr: Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
MtA: Millbrook	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MuC2*:				
Montmorenci	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, small stones.
Barce	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
MvE2: Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
MwC3: Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MxC2*:				
Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Cadiz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
MyA, MzB2: Mudlavia	Fair: large stones.	Probable	Probable	Poor: too clayey, small stones, area reclaim.

See footnotes at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ObB2 Ockley	Good	Probable	Improbable: too sandy.	Fair: too clayey, small stones, area reclaim.
OcA, OcB2 Ockley	Good	Probable	Probable	Poor: small stones, area reclaim.
OpB Ormas	Good	Probable	Probable	Fair: too sandy, small stones.
OsA, OsB Oshtemo	Good	Probable	Probable	Poor: small stones.
Pm Peotone	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Po Piankeshaw Variant	Fair: large stones.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Pp*. Pits				
PrA, PrB2 Proctor	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
PuA, PuB2 Proctor	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Rb Ragsdale	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RdA Rainsville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
RfB2*:				
Rainsville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Williamstown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
Rockfield	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
RlA Reesville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RoA, RoB2 Rockfield	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnotes at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RpG-------------------- Rodman	Poor: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
RtA, RtB2-------------- Rush	Good	Probable	Probable	Poor: area reclaim.
Sb--------------------- Sable	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SeA-------------------- Shadeland Variant	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, thin layer.
SlA-------------------- Starks	Fair: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Sr*:				
Stonelick--------------	Good	Probable	Improbable: too sandy.	Fair: small stones.
Moundhaven-------------	Good	Probable	Improbable: too sandy.	Poor: too sandy.
StB3, StC3------------- Strawn	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
SyB*:				
Symerton---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Varna------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TuC2------------------- Tuscola	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
TwB2------------------- Tuscola	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ud*, Ur*. Udorthents				
Wc--------------------- Wakeland Variant	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
We--------------------- Wallkill Variant	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: too clayey, wetness.
Wg--------------------- Warners Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Wh--------------------- Washtenaw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnotes at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WlA------------------- Waupecan	Good-----------------	Probable-------------	Probable-------------	Poor: area reclaim, small stones.
WpG------------------- Weikert Variant	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
WrA*:				
Williamsport---------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.
Elliott--------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
WtC2*:				
Williamstown---------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, slope.
Rainsville-----------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.
** This soil is a source of gravel at a depth of more than 80 inches.

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	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AfB2: Alford	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Am: Armiesburg Variant	Moderate: seepage.	Severe: no water.	Deep to water	Flooding	Erodes easily	Erodes easily.
BbA: Barce	Moderate: seepage.	Severe: slow refill.	Deep to water	Favorable	Favorable	Favorable.
BdB2*:						
Barce	Moderate: seepage, slope.	Severe: slow refill.	Deep to water	Slope	Favorable	Favorable.
Montmorenci	Moderate: seepage, slope.	Severe: slow refill.	Slope	Slope, wetness, rooting depth.	Wetness	Rooting depth.
Be: Beaucoup	Slight	Severe: slow refill.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding	Wetness.
Bk: Beckville	Severe: seepage.	Slight	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable.
BmE2: Billett	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Slope, droughty, soil blowing.	Soil blowing	Droughty.
BnC2: Billett	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, soil blowing.	Slope, droughty.
BoA: Blount	Slight	Severe: no water.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
BpD2*:						
Boyer	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Mudlavia	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
BrA: Brenton	Moderate: seepage.	Severe: cutbanks cave.	Frost action	Wetness	Wetness	Wetness.
BsA, BwA: Brenton	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Frost action	Wetness	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	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
CaB2: Cadiz	Moderate: seepage, slope.	Severe: no water.	Frost action, slope.	Slope, wetness, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
CbA: Camden	Moderate: seepage.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
CbB2: Camden	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
CdB2: Camden	Moderate: seepage, slope.	Severe: slow refill, cutbanks cave.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
CfA: Carmi	Severe: seepage.	Severe: no water.	Deep to water	Favorable	Too sandy	Favorable.
Cg: Comfrey	Moderate: seepage.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Ponding	Wetness.
Cs: Comfrey	Moderate: seepage.	Severe: cutbanks cave.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding	Wetness.
CtB2: Corwin	Moderate: seepage, slope.	Severe: slow refill.	Slope	Wetness, rooting depth, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Cz: Cyclone	Moderate: seepage.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Dw*:						
Drummer	Moderate: seepage.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Drummer, stratified sandy substratum	Severe: seepage.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Ponding	Wetness.
Dx: Drummer	Moderate: seepage.	Moderate: slow refill, cutbanks cave.	Ponding, frost action.	Ponding	Ponding	Wetness.
Dy: Du Page	Moderate: seepage.	Severe: no water.	Deep to water	Flooding	Favorable	Favorable.
EdB2: Eldean	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Erodes easily, too sandy.	Erodes easily, droughty.
EgA: Eldean	Severe: seepage.	Severe: no water.	Deep to water	Droughty, erodes easily.	Erodes easily, too sandy.	Erodes easily, droughty.
EvA: Elston	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing	Soil blowing, too sandy.	Favorable.
GgA: Gilboa	Moderate: seepage.	Severe: slow refill.	Favorable	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
GhB2: Glenhall	Severe: seepage.	Severe: cutbanks cave.	Frost action	Slope, wetness.	Wetness	Favorable.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
GkB2: Glenhall	Severe: seepage.	Severe: slow refill, cutbanks cave.	Frost action	Wetness, rooting depth, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
GoF: Gosport	Severe: slope.	Severe: no water.	Deep to water	Slope, thin layer, percs slowly.	Slope, area reclaim, percs slowly.	Slope, area reclaim, percs slowly.
HeG: Hennepin	Severe: slope.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
HfB: High Gap	Moderate: seepage, depth to rock, slope.	Severe: no water.	Deep to water	Slope, thin layer, erodes easily.	Depth to rock, area reclaim, erodes easily.	Erodes easily, depth to rock, area reclaim.
HhB2: High Gap Variant	Moderate: seepage, slope.	Severe: no water.	Percs slowly, thin layer, slope.	Slope, wetness, percs slowly.	Area reclaim, erodes easily.	Erodes easily, area reclaim.
HhC2: High Gap Variant	Severe: slope.	Severe: no water.	Percs slowly, thin layer, slope.	Slope, wetness, percs slowly.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
Hm, Ho: Houghton	Severe: seepage.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
IoB2: Iona	Moderate: seepage.	Moderate: slow refill.	Frost action	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
IpA: Ipava	Slight	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Ju: Jules	Moderate: seepage.	Severe: no water.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
LcA: Lafayette	Moderate: seepage.	Severe: cutbanks cave.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Ld: La Hogue	Severe: seepage.	Severe: cutbanks cave.	Frost action	Wetness	Wetness	Wetness.
Lk: La Hogue	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Frost action	Wetness	Wetness	Wetness.
Lp*:						
Landes	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing	Too sandy, soil blowing.	Favorable.
Chatterton	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
MaB3: Markham	Moderate: slope.	Severe: no water.	Deep to water	Slope, erodes easily.	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	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
McB2*:						
Markham	Moderate: slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Symerton	Moderate: seepage, slope.	Severe: slow refill.	Deep to water	Slope	Erodes easily	Erodes easily.
MdA Martinsville	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
MdB2 Martinsville	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
MdC2 Martinsville	Severe: seepage, slope.	Severe: no water.	Deep to water	Erodes easily	Slope, erodes easily.	Slope, erodes easily.
MoE2, MpC3, MpD3 Miami	Severe: slope.	Severe: no water.	Deep to water	Slope, rooting depth, erodes easily.	Slope, erodes easily.	Slope, erodes easily, rooting depth.
Mr Milford	Slight	Severe: slow refill.	Ponding, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.
MtA Millbrook	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
MuC2*:						
Montmorenci	Severe: slope.	Severe: slow refill.	Slope	Slope, wetness, rooting depth.	Slope, wetness.	Slope, rooting depth.
Barce	Severe: slope.	Severe: slow refill.	Deep to water	Slope	Slope	Slope.
MvE2, MwC3 Morley	Severe: slope.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope, erodes easily.	Slope, erodes easily, rooting depth.
MxC2*:						
Morley	Severe: slope.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope, erodes easily.	Slope, erodes easily, rooting depth.
Cadiz	Severe: slope.	Severe: no water.	Frost action, slope.	Slope, wetness, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
MyA Mudlavia	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones	Large stones, droughty.
MzB2 Mudlavia	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Large stones	Large stones, droughty.
ObB2 Ockley	Severe: seepage.	Severe: no water.	Deep to water	Slope, rooting depth.	Favorable	Rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
OcA----------------- Ockley	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
OcB2---------------- Ockley	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
OpB----------------- Ormas	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Soil blowing---	Droughty.
OsA----------------- Oshtemo	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
OsB----------------- Oshtemo	Severe: seepage.	Severe: no water.	Deep to water	Slope, soil blowing.	Too sandy, soil blowing.	Favorable.
Pm------------------ Peotone	Slight----------	Severe: slow refill.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
Po------------------ Piankeshaw Variant	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones---	Large stones, droughty.
Pp*. Pits						
PrA----------------- Proctor	Severe: seepage.	Severe: cutbanks cave.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
PrB2---------------- Proctor	Severe: seepage.	Severe: cutbanks cave.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
PuA----------------- Proctor	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
PuB2---------------- Proctor	Moderate: seepage, slope.	Severe: slow refill, cutbanks cave.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
Rb------------------ Ragsdale	Moderate: seepage.	Moderate: slow refill.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
RdA----------------- Rainsville	Moderate: seepage.	Severe: slow refill.	Favorable------	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
RfB2*:						
Rainsville--------	Moderate: seepage, slope.	Severe: slow refill.	Slope----------	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Williamstown------	Moderate: seepage, slope.	Severe: no water.	Slope----------	Slope, wetness, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Rockfield---------	Moderate: seepage, slope.	Severe: slow refill.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
RlA----------------- Reesville	Moderate: seepage.	Severe: no water.	Frost action---	Wetness, erodes easily.	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	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
RoA: Rockfield	Moderate: seepage.	Severe: slow refill.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
RoB2: Rockfield	Moderate: seepage, slope.	Severe: slow refill.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
RpG: Rodman	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
RtA: Rush	Moderate: seepage.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
RtB2: Rush	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Sb: Sable	Moderate: seepage.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
SeA: Shadeland Variant	Moderate: seepage.	Severe: no water.	Percs slowly, thin layer, frost action.	Wetness, percs slowly, thin layer.	Area reclaim, erodes easily, wetness.	Wetness, erodes easily, area reclaim.
SlA: Starks	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Sr*:						
Stonelick	Severe: seepage.	Severe: no water.	Deep to water	Flooding	Too sandy	Favorable.
Moundhaven	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
StB3: Strawn	Moderate: slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
StC3: Strawn	Severe: slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
SyB*:						
Symerton	Moderate: seepage.	Severe: slow refill.	Deep to water	Favorable	Erodes easily	Erodes easily.
Varna	Slight	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
TuC2: Tuscola	Severe: slope.	Severe: slow refill, cutbanks cave.	Slope	Slope, wetness, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
TwB2: Tuscola	Moderate: seepage, slope.	Severe: slow refill, cutbanks cave.	Slope	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Ud*, Ur*. Udorthents						

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Wc: Wakeland Variant	Severe: seepage.	Moderate: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
We: Wallkill Variant	Severe: seepage.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.
Wg: Warners Variant	Severe: seepage.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, slow intake, percs slowly.	Ponding	Wetness, percs slowly.
Wh: Washtenaw	Moderate: seepage.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
WlA: Waupecan	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Rooting depth	Erodes easily	Erodes easily, rooting depth.
WpG: Weikert Variant	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope, soil blowing, thin layer.	Slope, depth to rock, area reclaim.	Slope, depth to rock, area reclaim.
WrA*:						
Williamsport	Moderate: seepage.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Elliott	Slight	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
WtC2*:						
Williamstown	Severe: slope.	Severe: no water.	Frost action, slope.	Slope, wetness, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Rainsville	Severe: slope.	Severe: slow refill.	Slope	Slope, wetness, erodes easily.	Slope, erodes easily, wetness.	Slope, 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	
AfB2------------- Alford	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-30	5-15
	7-51	Silty clay loam, silt loam.	CL	A-6	0	100	100	90-100	80-100	30-40	10-20
	51-80	Silt loam, silt	ML, CL-ML, CL	A-4	0	100	100	90-100	70-100	<25	NP-10
Am--------------- Armiesburg Variant	0-23	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
	23-60	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-25
BbA-------------- Barce	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-100	50-90	15-30	4-15
	11-32	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-4, A-2-6	0	90-100	85-100	70-100	30-80	25-35	8-15
	32-42	Gravelly sandy clay loam, sandy clay loam.	SC	A-2-6, A-6	0-3	70-90	65-85	50-80	25-50	30-35	10-15
	42-50	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-100	70-95	50-75	20-35	5-15
	50-60	Loam-------------	CL, CL-ML	A-4	0-3	90-100	85-100	70-95	50-75	20-30	5-10
BdB2*:											
Barce------------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-100	50-90	15-30	4-15
	10-32	Loam, clay loam, silty clay loam.	CL, SC	A-6, A-4, A-2-6	0	90-100	85-100	70-100	30-80	25-35	8-15
	32-42	Gravelly sandy clay loam, sandy clay loam.	SC	A-2-6, A-6	0-3	70-90	65-85	50-80	25-50	30-35	10-15
	42-50	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-100	70-95	50-75	20-35	5-15
	50-60	Loam-------------	CL, CL-ML	A-4	0-3	90-100	85-100	70-95	50-75	20-30	5-10
Montmorenci------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-90	20-35	5-15
	8-17	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	95-100	90-100	75-95	55-95	30-45	10-25
	17-36	Clay loam, loam	CL	A-6, A-7	0-3	95-100	90-100	70-100	50-80	30-45	10-25
	36-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	75-95	50-75	20-30	5-15
Be--------------- Beaucoup	0-15	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-25
	15-40	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-30
	40-49	Stratified silt loam to silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	90-100	65-95	25-45	5-25
	49-60	Stratified silt loam to silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	90-100	60-95	20-40	5-20
Bk--------------- Beckville	0-5	Loam-------------	ML, CL-ML	A-4	0	100	98-100	85-100	60-90	<23	NP-7
	5-31	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
	31-60	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
BmB2------------- Billett	0-8	Sandy loam-------	SM, SC, SM-SC	A-4, A-2	0	100	95-100	60-100	25-50	<26	NP-8
	8-37	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-4, A-2	0-2	90-100	90-100	60-100	25-50	<28	NP-9
	37-45	Loamy fine sand, sandy loam, loamy sand.	SM	A-2, A-4	0-2	75-100	75-100	75-90	20-45	<21	NP-4
	45-60	Fine sand, sand, loamy sand.	SM, SP-SM	A-2, A-4, A-1	0-2	80-100	75-100	40-95	10-40	---	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	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
BnC2------------- Billett	0-8	Sandy loam-------	SM, SM-SC, SC	A-2, A-4	0	100	100	85-100	25-50	<25	2-10
	8-37	Sandy loam, fine sandy loam.	SM-SC, SC	A-2, A-4, A-6	0-10	90-100	90-100	85-100	25-50	20-30	5-15
	37-45	Loamy sand, sandy loam, fine sandy loam.	SM, SM-SC, SC	A-2, A-4, A-6	0-10	75-100	75-100	75-90	20-45	15-30	3-15
	45-60	Loamy fine sand, sand, gravelly loamy sand.	SM, SM-SC, SW-SM, SP-SM	A-2, A-1-b, A-3	0-10	60-100	60-100	20-75	5-30	<25	NP-5
BoA-------------- Blount	0-11	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	11-36	Silty clay loam, silty clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	80-90	75-85	35-60	15-35
	36-41	Silty clay loam, clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0-5	95-100	90-100	80-90	70-90	35-55	10-30
	41-60	Silty clay loam, silt loam.	CL	A-6	0-10	90-100	90-100	80-100	65-95	32-40	13-18
BpD2*:											
Boyer-----------	0-8	Gravelly sandy loam.	SM, SM-SC	A-2-4	0-5	70-85	65-80	40-55	20-30	<25	NP-7
	8-35	Sandy loam, gravelly sandy clay loam, gravelly 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
	35-60	Gravelly sand, very gravelly 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
Mudlavia--------	0-7	Cobbly loam------	CL-ML, CL, SM-SC, SC	A-4, A-6	25-40	55-85	55-75	45-75	35-70	20-30	4-14
	7-46	Extremely gravelly clay, extremely gravelly clay loam, extremely cobbly clay.	GC	A-2-7, A-7	25-50	30-60	25-50	20-50	15-50	45-65	25-40
	46-60	Extremely gravelly coarse sand, very gravelly loamy coarse sand.	GW, GP, GP-GM, GW-GM	A-1	25-50	15-60	10-50	5-30	0-10	<20	NP
BrA-------------- Brenton	0-14	Silt loam--------	CL, ML	A-6, A-4	0	100	95-100	95-100	85-100	30-40	8-15
	14-28	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	95-100	95-100	85-100	35-50	10-25
	28-52	Clay loam, loam, silt loam.	CL	A-6, A-7	0	100	95-100	90-100	75-95	30-45	10-20
	52-60	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

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	
BsA----------- Brenton	0-15	Silt loam--------	CL	A-6	0	100	100	90-100	70-90	30-35	10-15
	15-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	65-95	30-45	10-25
	38-48	Fine sandy loam	SM-SC, SC, CL-ML, CL	A-4, A-6	0	90-100	85-100	60-85	35-55	20-30	5-15
	48-58	Stratified loam to loamy sand.	SM-SC, SM, SC	A-4, A-2-4, A-1-b	0	90-100	85-100	40-85	15-50	<30	NP-10
	58-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-90	50-70	25-32	5-13
BwA----------- Brenton	0-13	Silt loam--------	CL	A-6	0	100	100	90-100	70-90	30-35	10-15
	13-36	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	65-95	30-45	10-25
	36-46	Fine sandy loam	SM-SC, SC, CL-ML, CL	A-4, A-6	0	90-100	85-100	60-85	35-55	20-30	5-15
	46-55	Stratified loam to loamy sand.	SM-SC, SM, SC	A-4, A-2-4, A-1-b	0	90-100	85-100	40-85	15-50	<30	NP-10
	55-60	Silty clay loam	CL	A-6	0-3	90-100	85-95	80-90	60-90	25-40	5-20
CaB2---------- Cadiz	0-8	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	85-95	25-30	6-10
	8-29	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	85-95	30-45	10-20
	29-36	Silty clay loam, clay loam.	CL	A-6, A-7	0-3	85-100	80-95	60-90	50-85	35-45	15-25
	36-60	Silty clay loam, silt loam.	CL	A-6	0-3	80-100	80-95	70-95	55-90	32-40	13-18
CbA, CbB2-------- Camden	0-7	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-35	3-15
	7-38	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	15-25
	38-53	Clay loam, sandy loam, loam.	ML, SC, SM, CL	A-2, A-4, A-6	0-5	90-100	85-100	60-100	30-70	20-40	3-15
	53-60	Stratified sand to loam.	SM, SC, ML, CL	A-2, A-4	0-5	90-100	80-100	50-80	20-60	<25	3-10
CdB2---------- Camden	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	8-35	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	35-50	Loam, sandy loam	SM-SC, SC, CL-ML, CL	A-4, A-2-4, A-2-6, A-6	0	90-100	85-100	50-95	25-75	20-30	4-14
	50-57	Stratified loamy sand to silt loam.	SM, SM-SC, SC	A-4	0	90-100	85-100	40-75	35-50	<30	NP-10
	57-60	Loam-------------	CL-ML, CL, SC, SM-SC	A-4, A-6	0-3	90-100	85-95	70-90	40-65	25-35	4-14
CfA----------- Carmi	0-16	Loam-------------	CL-ML, CL	A-4, A-6	0-5	90-100	90-100	55-70	50-60	15-35	5-15
	16-25	Gravelly sandy clay loam, gravelly sandy loam, gravelly loam.	SM-SC, SC, GC, GM-GC	A-2, A-4, A-6	0-5	65-95	60-80	50-65	20-40	15-35	5-15
	25-60	Stratified loamy sand to very gravelly coarse sand.	SP-SM, GP-GM, SM, GM	A-1	0-15	40-65	35-65	20-50	5-25	<20	NP-5

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	
Cg, Cs------------ Comfrey	0-9	Loam-------------	CL, ML	A-4, A-6	0	95-100	90-100	75-100	55-90	25-35	9-15
	9-30	Loam-------------	CL, ML	A-4, A-6	0	95-100	90-100	75-100	55-90	25-35	9-15
	30-45	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6, A-7, A-2-6	0	90-100	85-100	70-100	30-80	30-45	9-22
	45-60	Stratified silt loam to loamy sand.	CL, SC, CL-ML, SM-SC	A-4	0-1	90-100	85-100	60-90	40-70	20-30	4-10
CtB2------------- Corwin	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	95-100	80-100	50-90	20-30	4-12
	10-38	Clay loam, loam, silty clay loam.	CL	A-6, A-4	0	90-100	90-100	75-100	50-80	30-40	9-15
	38-60	Loam-------------	CL, ML, CL-ML	A-4	0-3	90-95	85-95	75-85	50-75	<25	3-8
Cz--------------- Cyclone	0-14	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	12-25
	14-48	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	15-30
	48-55	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-95	50-80	25-40	4-15
	55-60	Loam, silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	50-90	20-40	6-18
Dw*:											
Drummer---------	0-14	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	14-41	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	41-50	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	50-60	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
Drummer, stratified sandy substratum-----	0-12	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	12-45	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	45-57	Loam, silt loam, sandy loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-95	50-85	20-35	5-15
	57-60	Stratified silt loam to sand.	SM-SC, SM	A-2-4, A-4	0	85-100	85-100	55-80	20-45	<25	NP-6
Dx--------------- Drummer	0-15	Silty clay loam	CL	A-6, A-7	0	100	100	100	80-100	30-50	15-30
	15-52	Silty clay loam	CL	A-6, A-7	0	100	100	100	80-100	30-50	15-30
	52-61	Clay loam, silt loam, sandy loam.	CL	A-6, A-7	0	100	95-100	85-100	50-80	30-50	15-30
	61-80	Sand and gravel, sand.	GM, GW-GM, SW-SM, SM	A-1	0-5	40-95	30-90	30-50	5-15	---	NP
Dy--------------- Du Page	0-26	Loam-------------	CL	A-6, A-7	0	95-100	95-100	90-100	70-95	30-45	11-21
	26-60	Sandy loam, loam, silt loam.	CL	A-4, A-6, A-7	0	90-100	85-100	65-100	55-95	25-45	7-20

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	
EdB2-------------- Eldean	0-8	Gravelly loam----	ML, CL-ML, GM, SM	A-4, A-6	0-10	65-90	60-80	55-75	40-60	25-40	4-12
	8-30	Gravelly clay, gravelly clay loam, very gravelly clay.	CL, ML	A-7, A-6	0-5	65-100	50-100	55-95	50-80	38-50	12-23
	30-37	Very gravelly clay loam, gravelly sandy loam.	CL, GC, SC	A-4, A-6, A-7, A-2	0-10	55-85	45-85	45-75	30-60	30-45	8-20
	37-60	Stratified very gravelly loamy coarse sand to extremely gravelly coarse sand.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
EgA-------------- Eldean	0-9	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	9-29	Clay, silty clay loam, very gravelly clay losm.	CL, ML	A-7, A-6	0-5	65-100	50-100	55-95	50-80	38-50	12-23
	29-39	Very gravelly clay loam, gravelly sandy loam.	CL, GC, SC	A-4, A-6, A-7, A-2	0-10	55-85	45-85	45-75	30-60	30-45	8-20
	39-60	Stratified very gravelly loamy coarse sand to extremely gravelly coarse sand.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
EvA-------------- Elston	0-19	Sandy loam-------	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	60-85	30-55	<20	NP-5
	19-25	Sandy loam, loam, sandy clay loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	75-95	50-80	35-65	<25	NP-7
	25-70	Loamy sand, sandy loam, sand.	SP-SM, SM	A-2-4, A-3, A-1-b	0-3	95-100	75-95	45-75	5-30	<20	NP
	70-80	Sand, gravelly loamy sand, sandy loam.	SP-SM, SM	A-3, A-2-4, A-1-b	0-3	95-100	70-95	40-70	5-25	---	NP
GgA-------------- Gilboa	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	55-90	20-35	5-15
	12-18	Silty clay loam	CL	A-6, A-7	0	90-100	80-100	80-100	70-95	35-45	15-25
	18-45	Clay loam, loam	CL	A-6, A-7	0-3	90-100	75-95	60-95	50-80	30-45	10-25
	45-52	Loam-------------	CL-ML, CL	A-4, A-6	0-3	90-100	85-100	70-100	50-90	25-35	5-15
	52-60	Loam-------------	CL-ML, CL	A-4, A-6	0-3	90-100	85-100	70-100	50-90	25-35	5-15

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	
GhB2------------- Glenhall	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-90	25-35	5-15
	8-32	Clay loam, sandy clay loam, silty clay loam.	CL, SC	A-6, A-7, A-2-6, A-2-7	0	90-100	85-95	65-95	30-80	35-45	15-25
	32-43	Loam-------------	CL, SC, CL-ML, SM-SC	A-6, A-4	0	80-100	75-95	60-90	45-65	25-35	5-15
	43-50	Gravelly sandy loam, gravelly sandy clay loam.	SC, SM-SC	A-2-4, A-2-6, A-4, A-6	0	65-80	60-75	35-70	15-40	20-35	5-15
	50-60	Stratified sand to silt loam.	SM, SM-SC, SC	A-1-b, A-2-4, A-4	0	80-100	75-95	40-85	15-50	<30	NP-10
GkB2------------- Glenhall	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	55-90	25-35	5-15
	7-35	Silty clay loam, clay loam.	CL	A-6, A-7	0	90-100	85-100	75-100	60-95	35-45	15-25
	35-45	Gravelly sandy clay loam.	SC, GC	A-2-6, A-6	0	65-80	60-75	45-70	20-45	30-40	10-20
	45-55	Stratified sand to silt loam.	SM-SC, SM, SC	A-2-4, A-4, A-1-b	0	80-100	75-95	35-70	15-40	<30	NP-10
	55-60	Loam-------------	CL-ML, CL	A-4, A-6	0-3	95-100	85-95	70-90	50-70	25-35	5-15
GoF-------------- Gosport	0-4	Shaly silt loam	CL, CL-ML	A-4, A-6	0-5	85-95	60-80	50-80	50-70	25-40	5-15
	4-30	Shaly silty clay loam.	CL	A-7	0-5	85-95	60-80	55-80	50-75	40-50	20-25
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
HeG-------------- Hennepin	0-3	Loam-------------	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	70-100	60-95	25-45	5-20
	3-13	Loam, clay loam, silt loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	75-100	65-100	35-95	20-50	5-25
	13-60	Loam, clay loam, silt loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	75-100	65-100	35-95	20-50	5-25
HfB-------------- High Gap	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	8-30	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-45	15-25
	30-38	Sandy loam, sandy clay loam.	SC	A-4, A-6, A-2-4, A-2-6	0-2	95-100	90-95	55-85	30-50	25-32	7-13
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HhB2, HhC2------- High Gap Variant	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	60-90	25-35	5-15
	8-24	Clay loam--------	CL	A-7, A-6	0	95-100	90-100	80-100	60-80	35-45	15-25
	24-31	Sandy clay loam, sandy clay.	CL, SC	A-7, A-2-7	0	95-100	75-100	60-95	25-60	40-50	20-25
	31-36	Shaly silty clay, very shaly silty clay loam.	CL, CH, GC, SC	A-7	0-5	50-90	40-75	35-75	35-75	40-55	20-30
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
Hm, Ho----------- Houghton	0-60	Sapric material	PT	A-8	0	---	---	---	---	---	---
IoB2------------- Iona	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-35	5-15
	9-55	Silty clay loam, silt loam.	CL	A-6, A-7, A-4	0	100	100	90-100	80-100	25-45	10-25
	55-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-35	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	
IpA-------------- Ipava	0-12	Silt loam, silty clay loam.	ML, CL	A-6	0	100	100	95-100	90-100	25-40	10-20
	12-30	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	90-100	45-70	25-40
	30-60	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-20
Ju--------------- Jules	0-10	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	10-60	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-95	27-36	9-15
LcA-------------- Lafayette	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	13-33	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	33-47	Sandy clay loam	CL, SC	A-6, A-2-6	0	85-100	75-95	60-90	25-55	30-40	10-20
	47-61	Gravelly loam, gravelly sandy loam.	SM-SC, SC	A-2-4, A-2-6, A-1-b	0-3	70-90	50-75	30-55	15-30	20-35	5-15
	61-70	Gravelly loamy coarse sand, very gravelly coarse sand, gravelly coarse sand.	SM, SP-SM, GM, GP-GM	A-1, A-3, A-2	1-5	45-75	35-75	20-70	5-15	---	NP
Ld--------------- La Hogue	0-11	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	80-100	50-80	20-35	3-10
	11-43	Sandy clay loam, loam, clay loam.	CL, SC	A-6, A-4	0	100	100	80-100	40-85	25-40	8-20
	43-50	Sandy loam, loamy sand, silt loam.	ML, CL, SM, SC	A-2, A-4, A-6	0	100	90-100	75-90	15-70	15-30	2-15
	50-60	Stratified fine sand to silt loam.	CL, ML, SC, SM	A-4, A-2	0	90-100	80-100	50-95	10-60	<25	NP-10
Lk--------------- La Hogue	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	60-90	25-35	5-15
	12-40	Clay loam, sandy clay loam.	CL, SC	A-6, A-2-6	0	100	95-100	75-100	30-80	30-40	10-20
	40-47	Stratified sandy loam to loamy sand.	SC, SM-SC	A-4, A-2-4, A-6, A-2-6	0	95-100	90-100	50-70	20-40	20-30	5-15
	47-55	Stratified loamy sand to silt loam.	SM-SC, SM, SC	A-4, A-2-4, A-1-b	0	95-100	90-100	40-65	20-40	<30	NP-10
	55-60	Silt loam, loam	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-90	50-65	25-35	5-15
Lp*: Landes----------	0-11	Fine sandy loam	SM, SC, SM-SC	A-4, A-2-4	0	100	70-100	70-95	20-50	<25	NP-10
	11-38	Sandy loam, fine sandy loam, loamy fine sand.	SM, CL-ML, SC, SM-SC	A-4, A-2-4	0	100	85-100	70-100	15-60	<25	NP-10
	38-60	Stratified sand to silt loam.	SM, SP-SM, SC, SM-SC	A-4, A-2-4	0	100	85-100	70-85	10-50	<30	NP-10

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	
Lp*:											
Chatterton	0-12	Loamy sand	SP-SM, SM, SM-SC	A-1, A-2-4	0	100	95-100	45-75	10-30	<25	NP-4
	12-24	Stratified loamy sand to silt loam.	SM, SM-SC	A-2-4, A-4	0	100	95-100	50-80	20-40	<25	NP-4
	24-32	Stratified loamy sand to silt loam.	SM, SM-SC	A-2-4, A-4	0	100	95-100	50-80	20-40	<25	NP-4
	32-60	Stratified sand to loam.	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-80	5-15	<20	NP
MaB3 Markham	0-7	Silty clay loam	CL, CH	A-6, A-7	0-5	95-100	95-100	85-100	80-90	30-55	15-28
	7-28	Silty clay, silty clay loam.	CL, CH	A-7	0-10	95-100	90-100	85-100	80-90	40-54	15-28
	28-60	Silty clay loam, silt loam.	CL	A-6	0-10	95-100	90-100	80-100	65-95	32-40	13-18
McB2*:											
Markham	0-8	Silt loam	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	85-95	23-40	6-17
	8-38	Silty clay, silty clay loam.	CL, CH	A-7	0-10	95-100	90-100	85-100	80-90	40-54	15-28
	38-60	Silty clay loam, silt loam.	CL	A-6	0-10	95-100	90-100	80-100	65-95	32-40	13-18
Symerton	0-10	Silt loam	CL	A-7, A-6	0	100	100	95-100	90-100	30-45	10-20
	10-32	Silty clay loam, gravelly loam, clay loam.	CL	A-6	0-10	95-100	75-95	75-900	60-90	35-45	15-25
	32-60	Silt loam, silty clay loam.	CL	A-6	0-5	95-100	90-100	80-100	65-95	32-40	13-18
MdA, MdB2, MdC2 Martinsville	0-11	Loam	ML, CL-ML, CL	A-4	0	100	85-100	75-100	65-90	<25	3-8
	11-43	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-2-4, A-2-6, A-4, A-6	0	95-100	85-100	70-100	30-95	25-40	7-15
	43-56	Sandy loam, loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-2-4, A-2-6, A-4, A-6	0	95-100	85-100	55-95	30-95	20-30	5-11
	56-60	Stratified sand to silt loam.	SM, SM-SC, ML, CL-ML	A-1, A-2-4, A-4	0	95-100	85-100	45-95	10-75	<25	NP-8
MoE2 Miami	0-7	Loam	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	7-19	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	19-29	Loam	CL, SC	A-4, A-6	0-3	85-100	85-100	70-90	40-90	25-35	8-15
	29-60	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	0-6	Clay loam	CL	A-6	0	100	90-100	75-95	65-95	30-40	15-20
	6-20	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	20-25	Loam	CL, SC	A-4, A-6	0-3	85-100	85-100	70-90	40-90	25-35	8-15
	25-60	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

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	
Mr---------------- Milford	0-16	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	75-95	40-55	20-30
	16-55	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	55-60	Stratified clay to sandy loam.	CL, SC	A-6, A-7	0	95-100	95-100	90-100	45-100	25-50	10-30
MtA--------------- Millbrook	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	8-32	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	32-42	Loam, clay loam, sandy loam.	CL, SC	A-6	0	90-100	90-100	70-90	40-80	25-40	10-25
	42-57	Stratified silt loam to sand.	SM-SC, SM, SC	A-4	0	95-100	90-100	50-85	35-50	<30	NP-10
	57-60	Loam-------------	CL-ML, CL	A-4, A-6	0-3	95-100	85-95	70-90	50-70	25-35	5-15
MuC2*: Montmorenci-----	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-90	20-35	5-15
	8-30	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	95-100	90-100	75-95	55-95	30-45	10-25
	30-35	Clay loam, loam	CL	A-6, A-7	0-3	95-100	90-100	70-100	50-80	30-45	10-25
	35-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	75-95	50-75	20-30	5-15
Barce-----------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-100	50-90	15-30	4-15
	10-32	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-4, A-2-6	0	90-100	85-100	70-100	30-80	25-35	8-15
	32-42	Gravelly sandy clay loam, sandy clay loam.	SC	A-2-6, A-6	0-3	70-90	65-85	50-80	25-50	30-35	10-15
	42-50	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-100	70-95	50-75	20-35	5-15
	50-60	Loam-------------	CL, CL-ML	A-4	0-3	90-100	85-100	70-95	50-75	20-30	5-10
MvE2-------------- Morley	0-7	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	7-29	Silty clay loam, clay loam, silty clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-35
	29-60	Silty clay loam, silt loam.	CL	A-6	0-10	95-100	90-100	80-100	65-95	32-40	13-18
MwC3-------------- Morley	0-7	Silty clay loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	80-90	30-45	15-25
	7-24	Silty clay loam, clay loam, silty clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-35
	24-60	Silty clay loam, silt loam.	CL	A-6	0-10	95-100	90-100	80-100	65-95	32-40	13-18
MxC2*: Morley-----------	0-6	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	6-29	Silty clay loam, clay loam, silty clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-35
	29-60	Silty clay loam, silt loam.	CL	A-6	0-10	95-100	90-100	80-100	65-95	32-40	13-18
Cadiz-----------	0-7	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	85-95	25-30	6-10
	7-32	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	85-95	30-45	10-20
	32-39	Silty clay loam, clay loam.	CL	A-6, A-7	0-3	80-100	80-95	60-90	50-85	35-45	15-25
	39-60	Silty clay loam, silt loam.	CL	A-6	0-3	80-100	80-95	70-95	55-90	32-40	13-18

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	
MyA, MzB2-------- Mudlavia	0-7	Gravelly silt loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0-15	75-80	60-80	50-80	40-75	20-30	4-14
	7-37	Extremely gravelly clay, extremely gravelly clay loam.	GC	A-2-7, A-7	25-50	30-60	25-50	20-50	15-50	45-65	25-40
	37-54	Extremely gravelly clay, extremely cobbly clay.	GC	A-2-7, A-7	25-50	30-60	25-50	20-50	15-50	50-65	25-40
	54-60	Extremely gravelly coarse sand, very gravelly loamy coarse sand, extremely gravelly loamy coarse sand.	GW, GP, GP-GM, GW-GM	A-1	25-50	15-60	10-50	5-30	0-10	<20	NP
ObB2------------ Ockley	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	95-100	80-95	55-70	20-30	4-14
	8-24	Loam, clay loam, fine sandy loam.	SM, ML, SC, CL	A-4, A-2-4	0	95-100	85-100	60-95	30-75	<30	3-10
	24-53	Gravelly sandy clay loam, gravelly clay loam, sandy loam.	SC, CL, SM	A-2-4, A-2-6, A-4, A-6	0	65-85	60-80	45-80	20-60	23-40	7-15
	53-60	Stratified gravel to loamy sand.	SP-SM, SP	A-1, A-3, A-2-4	0	80-100	40-90	20-70	2-25	---	NP
OcA, OcB2-------- Ockley	0-9	Silt loam--------	CL, ML, CL-ML	A-4	0	95-100	85-100	70-100	50-90	15-30	3-10
	9-31	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
	31-60	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
	60-80	Gravelly coarse sand, gravelly loamy coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	10-40	2-10	---	NP
OpB------------- Ormas	0-7	Loamy sand-------	SM	A-2-4	0	95-100	95-100	50-75	15-30	---	NP
	7-37	Sand, loamy 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
	37-72	Gravelly sandy clay loam, gravelly coarse sandy loam, gravelly fine sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2-4, A-2-6	0-3	60-80	55-80	35-70	20-45	20-40	6-20
	72-80	Very gravelly, coarse sand, gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-3, A-1-b, A-2-4	0-3	35-80	30-80	30-55	3-12	---	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	
OsA-------------- Oshtemo	0-9	Coarse sandy loam	SM-SC, SC	A-2-4, A-4	0	95-100	85-95	50-70	25-40	<25	4-10
	9-44	Coarse sandy loam, sandy clay loam, gravelly sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	95-100	60-95	60-85	25-45	12-30	2-16
	44-56	Loamy sand, coarse sand, gravelly loamy sand.	SM, SP-SM	A-2, A-3	0	85-95	60-95	30-70	5-30	---	NP
	56-60	Stratified loamy sand to gravel.	SP-SM, GP, SP, GP-GM	A-1, A-2, A-3	0-5	40-90	35-85	20-60	0-10	---	NP
OsB-------------- Oshtemo	0-10	Coarse sandy loam	SM-SC, SC	A-2-4, A-4	0	95-100	85-95	50-70	25-40	<25	4-10
	10-41	Coarse sandy loam, sandy clay loam, sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	95-100	60-95	60-85	25-45	12-30	2-16
	41-58	Loamy sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-2, A-3	0	85-95	60-95	30-70	5-30	---	NP
	58-60	Gravelly sand, gravelly coarse sand.	SP-SM, GP, SP, GP-GM	A-1, A-2, A-3	0-5	40-90	35-85	20-60	0-10	---	NP
Pm--------------- Peotone	0-21	Silty clay loam	CH, CL	A-7	0	100	95-100	95-100	80-100	40-65	15-35
	21-47	Silty clay loam, silty clay.	CH, CL	A-7	0-5	100	95-100	90-100	85-100	41-70	17-39
	47-60	Silty clay loam, silt loam.	CL, CH, ML, MH	A-7, A-6	0-5	95-100	95-100	90-100	75-98	30-60	14-29
Po--------------- Piankeshaw Variant	0-7	Gravelly silt loam.	SM, SM-SC, ML, CL-ML	A-4	5-25	55-85	50-75	40-75	35-70	<28	NP-9
	7-45	Extremely cobbly loam, extremely gravelly loam.	GC, GP-GM, GM, GM-GC	A-4, A-2-4, A-1	35-45	30-60	20-50	15-50	10-40	<28	NP-9
	45-60	Extremely gravelly sandy loam, gravelly loamy sand.	GC, GP-GM, GP-GC, GM	A-1-a, A-2-4	25-45	25-40	15-30	5-25	5-15	<28	NP-9
Pp*. Pits											
PrA, PrB2-------- Proctor	0-11	Silt loam--------	CL	A-6	0	100	100	95-100	85-100	25-40	10-20
	11-35	Silty clay loam	CL	A-7, A-6	0	95-100	90-100	85-100	85-100	25-50	10-25
	35-48	Clay loam, loam, silty clay loam.	CL, SC, CL-ML, SM-SC	A-6, A-7, A-2, A-4	0	90-100	85-100	75-100	30-80	20-45	5-25
	48-60	Stratified sand to loam.	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	
PuA, PuB2-------- Proctor	0-10	Silt loam--------	CL	A-6	0	100	100	90-100	70-90	30-35	10-15
	10-31	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	31-45	Loam-------------	CL, CL-ML	A-4, A-6	0	90-100	85-100	70-95	50-75	20-30	4-14
	45-55	Stratified loamy sand to sandy loam.	SC, SM-SC, SM	A-4, A-2-4, A-1-b	0	90-100	85-100	40-75	15-50	<30	NP-10
	55-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	90-100	85-95	70-90	40-65	25-35	5-15
Rb--------------- Ragsdale	0-8	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	70-100	20-30	7-12
	8-48	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	80-95	25-35	8-13
	48-60	Silt loam--------	CL-ML, ML, CL	A-4	0	100	100	90-100	70-90	<25	3-8
RdA-------------- Rainsville	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	20-30	4-15
	9-18	Silty clay loam, silt loam.	CL	A-6	0	100	95-100	85-100	75-95	30-40	10-20
	18-29	Loam, clay loam	CL	A-6	0-3	90-100	90-100	75-100	55-80	30-40	10-20
	29-46	Loam, sandy clay loam.	CL, SC	A-2-6, A-6	0-3	90-100	75-90	60-75	25-75	30-40	10-20
	46-55	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-95	50-80	25-35	5-15
	55-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-95	50-80	25-35	5-15
RfB2*:											
Rainsville------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	20-30	4-15
	8-13	Silty clay loam, silt loam.	CL	A-6	0	100	95-100	85-100	75-95	30-40	10-20
	13-30	Loam, clay loam	CL	A-6	0-3	90-100	90-100	75-100	55-80	30-40	10-20
	30-42	Loam, sandy clay loam.	CL, SC	A-2-6, A-6	0-3	90-100	75-90	60-75	25-75	30-40	10-20
	42-48	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-95	50-80	25-35	5-15
	48-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-95	50-80	25-35	5-15
Williamstown----	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	4-15
	9-30	Clay loam, silty clay loam.	CL	A-6	0	100	95-100	85-100	70-95	30-40	10-20
	30-35	Loam-------------	CL, CL-ML	A-6, A-4	0	100	95-100	80-95	60-80	20-35	5-15
	35-60	Loam-------------	ML, CL-ML, CL	A-4, A-6	0-2	100	95-100	80-95	55-75	20-35	3-11
Rockfield-------	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	7-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-20
	27-52	Clay loam, loam	CL	A-6, A-7	0	95-100	85-100	70-100	50-80	30-45	10-20
	52-60	Loam-------------	CL, CL-ML	A-6, A-4	0-3	95-100	90-95	70-90	50-75	25-35	5-15
	60-80	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-95	70-90	50-75	20-30	5-15
RlA-------------- Reesville	0-8	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	25-35	4-10
	8-33	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	85-100	80-100	20-50	4-28
	33-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	80-90	20-40	4-20
RoA, RoB2-------- Rockfield	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	13-31	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-20
	31-50	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	95-100	85-100	70-100	50-80	30-45	10-20
	50-56	Loam-------------	CL, CL-ML	A-6, A-4	0-3	95-100	90-95	70-90	50-75	25-35	5-15
	56-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-95	70-90	50-75	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	
RpG-------------- Rodman	0-6	Gravelly loam----	ML, CL, SM, SC	A-4	0-2	70-85	65-75	60-75	36-65	<30	3-9
	6-15	Gravelly loam, gravelly 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
	15-60	Very gravelly coarse sand, very gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	27-50	7-20	2-10	---	NP
RtA, RtB2-------- Rush	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-15
	10-37	Silty clay loam, silt loam.	CL	A-6	0	100	100	90-100	70-100	30-40	10-20
	37-54	Clay loam, sandy clay loam, loam.	CL, SC	A-6, A-2-6	1-5	80-100	80-100	60-100	25-75	30-40	10-20
	54-60	Gravelly loam, gravelly sandy clay loam, gravelly sandy loam.	CL-ML, CL, SM-SC, SC	A-2-4, A-2-6, A-4, A-6	1-5	65-80	55-75	35-70	15-40	25-35	5-15
	60-80	Stratified gravelly loamy coarse sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-2-4, A-1	1-5	45-70	35-55	20-40	2-15	---	NP
Sb-------------- Sable	0-13	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	95-100	41-65	15-35
	13-45	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	95-100	40-55	20-35
	45-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	30-40	10-20
SeA------------- Shadeland Variant	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	60-90	25-35	5-15
	10-13	Silty clay-------	CH	A-7	0	95-100	90-100	85-100	80-95	50-55	25-30
	13-29	Clay loam, clay	CL	A-7	0	90-100	85-100	75-100	60-95	40-50	20-30
	29-34	Shaly silty clay	CH, CL	A-7	0-5	80-100	60-75	55-75	50-75	45-55	25-30
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SlA------------- Starks	0-8	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	90-100	70-90	25-35	5-15
	8-30	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	30-50	Loam-------------	CL, CL-ML	A-6, A-4	0	90-100	85-100	70-95	50-75	25-35	5-15
	50-56	Stratified silt loam to loamy sand.	SC, SM-SC, SM	A-4, A-2-4, A-1-b	0	90-100	85-100	40-75	15-50	<30	NP-10
	56-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	90-100	85-95	70-90	40-65	25-35	5-15
Sr*:											
Stonelick-------	0-9	Loam-------------	ML, CL, SM, CL-ML	A-4	0	85-100	75-100	60-95	45-90	20-32	2-10
	9-60	Stratified loam to fine sand.	SM, SP-SM	A-2, A-4, A-3, A-1-b	0	85-100	75-100	40-60	5-40	<15	NP
Moundhaven------	0-8	Loamy fine sand	SM	A-2-4	0	100	95-100	50-75	15-30	<20	NP-4
	8-35	Stratified sand to silt loam.	SW-SM, SM, SP-SM	A-3, A-2-4	0	100	95-100	50-80	5-35	<20	NP-3
	35-60	Loamy sand, sand	SP, SP-SM, SM	A-1-b, A-2-4, A-3	0	100	95-100	45-75	3-30	<20	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	
StB3, StC3: Strawn	0-7	Clay loam	CL	A-6, A-7	0-5	90-100	80-100	75-95	50-95	30-45	10-25
	7-13	Silty clay loam, clay loam.	CL	A-6, A-7	0-5	90-100	80-100	75-95	50-95	25-45	10-25
	13-60	Loam, silt loam, clay loam.	CL, SC	A-4, A-6	0-5	75-100	70-100	60-95	40-95	20-35	7-20
SyB*: Symerton	0-11	Silt loam	CL	A-7, A-6	0	100	100	95-100	90-100	30-45	10-20
	11-39	Silty clay loam, gravelly loam, clay loam.	CL	A-7, A-6	0-10	95-100	75-95	75-90	60-90	35-45	15-25
	39-60	Silt loam, silty clay loam.	CL	A-6	0-5	95-100	90-100	80-100	65-95	32-40	13-18
Varna	0-11	Silt loam	CL	A-6, A-4	0-5	95-100	95-100	95-100	85-95	25-40	8-20
	11-34	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	85-100	85-100	80-100	35-56	15-29
	34-60	Silty clay loam, silt loam.	CL	A-6	0-10	95-100	85-100	75-100	60-95	32-40	13-18
TuC2: Tuscola	0-8	Loam	ML, CL-ML, CL	A-4	0	100	100	85-100	70-90	<30	3-10
	8-39	Loam, clay loam	CL	A-6	0	100	100	85-100	60-80	25-40	10-20
	39-49	Sandy loam	SM-SC, SC	A-2-4, A-4	0	100	100	60-70	30-40	20-30	5-10
	49-58	Stratified loamy fine sand to silt loam.	CL-ML, ML, SM, SM-SC	A-4	0	98-100	95-100	75-90	35-70	<20	NP-5
	58-60	Loam	CL, ML, CL-ML	A-4	0-2	90-100	85-100	70-95	50-75	<25	3-8
TwB2: Tuscola	0-8	Silt loam	ML, CL-ML, CL	A-4	0	100	100	85-100	70-90	<30	3-10
	8-39	Loam, clay loam	CL	A-6	0	100	100	85-100	60-80	25-40	10-20
	39-49	Sandy loam	SM-SC, SC	A-2-4, A-4	0	100	100	60-70	30-40	20-30	5-10
	49-58	Stratified loamy fine sand to silt loam.	CL-ML, ML, SM, SM-SC	A-4	0	98-100	95-100	75-90	35-70	<20	NP-5
	58-60	Loam	CL, ML, CL-ML	A-4	0-2	90-100	85-100	70-95	50-75	<25	3-8
Ud*, Ur*. Udorthents											
Wc: Wakeland Variant	0-6	Silt loam	CL, CL-ML, ML	A-4	0	100	95-100	85-100	65-90	<28	NP-9
	6-31	Silt loam	CL, CL-ML, ML	A-4	0	100	95-100	85-100	65-90	<28	NP-9
	31-45	Silt loam	CL-ML, ML, CL	A-4	0	95-100	95-100	85-100	65-90	<28	NP-9
	45-60	Very fine sandy loam.	CL-ML, ML, SM-SC, SM	A-4	0-1	95-100	90-100	75-95	45-65	<28	NP-9
We: Wallkill Variant	0-9	Silty clay loam	CL	A-6	0	100	95-100	90-100	80-95	30-40	10-15
	9-31	Silty clay loam, silty clay.	CL	A-7-6	0	100	95-100	90-100	80-95	40-50	15-20
	31-60	Sapric material, muck.	PT	A-8	0	---	---	---	---	---	---

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	
Wg---------------- Warners Variant	0-16	Silty clay--------	CL, CH	A-7	0	100	95-100	90-100	85-95	45-55	25-30
	16-35	Silty clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	85-95	40-55	20-30
	35-48	Marl--------------	OL	A-4	0	100	95-100	80-90	60-80	---	NP
	48-60	Fine sandy loam	SM, SM-SC	A-4	0	85-100	80-100	55-85	30-55	<20	NP-5
Wh---------------- Washtenaw	0-8	Silt loam---------	ML, CL	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
	8-22	Silt loam---------	CL, ML	A-6, A-4	0	100	100	90-100	70-90	27-36	4-12
	22-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	90-100	80-95	36-50	15-28
WlA--------------- Waupecan	0-12	Silt loam---------	CL	A-4, A-6	0	100	100	90-100	85-95	20-35	8-15
	12-34	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	34-62	Sandy loam, gravelly loamy sand, loam.	SM, SM-SC ML, CL-ML	A-2-4, A-4	0	70-95	65-90	30-85	10-70	<20	NP-10
	62-80	Very gravelly coarse sand, gravelly coarse sand, gravelly loamy coarse sand.	GP, SP, SP-SM, GP-GM	A-1	10-35	40-95	30-85	30-50	0-15	---	NP
WpG--------------- Weikert Variant	0-5	Fine sandy loam	SM-SC, SC	A-4, A-2-4	0-10	80-90	75-85	50-75	30-50	20-30	4-10
	5-27	Channery fine sandy loam, channery sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-2-4, A-1	0-10	65-85	60-75	35-65	15-45	20-30	4-10
	27	Weathered bedrock.	---	---	---	---	---	---	---	---	---
WrA*: Williamsport----	0-11	Silt loam---------	CL	A-6	0	100	100	90-100	70-90	30-35	10-15
	11-30	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	15-30
	30-44	Loam--------------	CL, CL-ML	A-4, A-6	0	80-100	75-95	60-90	50-75	20-35	5-15
	44-51	Silty clay loam, silt loam.	CL	A-6, A-7	0-1	95-100	90-95	85-95	75-90	35-45	15-20
	51-60	Silt loam, silty clay loam.	CL	A-6	0-1	95-100	90-95	80-95	60-90	32-40	13-18
Elliott----------	0-10	Silt loam---------	CL	A-6, A-4	0	95-100	95-100	95-100	75-100	30-40	8-18
	10-42	Silty clay, silty clay loam, clay.	CH, CL	A-6, A-7	0-5	95-100	90-100	90-100	70-100	30-52	11-26
	42-60	Silty clay loam, silt loam.	CL	A-6	0-5	90-100	85-100	75-100	60-95	32-40	13-18
WtC2*: Williamstown----	0-7	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	4-15
	7-29	Clay loam, silty clay loam.	CL	A-6	0	100	95-100	85-100	70-95	30-40	10-20
	29-34	Loam--------------	CL, CL-ML	A-6, A-4	0	100	95-100	80-95	60-80	20-35	5-15
	34-60	Loam--------------	ML, CL-ML, CL	A-4, A-6	0-2	100	95-100	80-95	55-75	20-35	3-11

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	
WtC2*:											
Rainsville------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	20-30	4-15
	8-32	Loam, clay loam	CL	A-6	0-3	90-100	90-100	75-100	55-80	30-40	10-20
	32-40	Loam, sandy clay loam.	CL, SC	A-2-6, A-6	0-3	90-100	75-90	60-75	25-75	30-40	10-20
	40-46	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-95	50-80	25-35	5-15
	46-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	70-95	50-80	25-35	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 K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
AfB2----------- Alford	0-7	12-26	1.25-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	5	5	1-3
	7-51	22-32	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	51-80	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.1-8.4	Low----------	0.37			
Am-------------- Armiesburg Variant	0-23	30-40	1.30-1.40	0.6-2.0	0.21-0.23	7.4-8.4	Moderate-----	0.28	5	4L	2-4
	23-60	35-40	1.50-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Moderate-----	0.43			
BbA------------- Barce	0-11	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
	11-32	22-30	1.40-1.65	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.32			
	32-42	27-30	1.55-1.65	0.6-2.0	0.12-0.15	5.1-7.3	Moderate-----	0.32			
	42-50	18-27	1.55-1.70	0.2-0.6	0.14-0.19	6.6-7.8	Low----------	0.43			
	50-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			
BdB2*:											
Barce-----------	0-10	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
	10-32	22-30	1.40-1.65	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.32			
	32-42	27-30	1.55-1.65	0.6-2.0	0.12-0.15	5.1-7.3	Moderate-----	0.32			
	42-50	18-27	1.55-1.70	0.2-0.6	0.14-0.19	6.6-7.8	Low----------	0.43			
	50-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			
Montmorenci-----	0-8	15-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	4	5	2-4
	8-17	25-35	1.40-1.60	0.6-2.0	0.15-0.20	5.6-7.3	Moderate-----	0.32			
	17-36	25-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.32			
	36-60	14-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.32			
Be-------------- Beaucoup	0-15	27-35	1.25-1.45	0.2-0.6	0.21-0.23	5.6-7.8	Moderate-----	0.32	5	7	5-6
	15-40	27-35	1.30-1.50	0.2-0.6	0.18-0.20	5.6-7.8	Moderate-----	0.32			
	40-49	15-30	1.35-1.55	0.2-0.6	0.18-0.22	5.6-7.8	Moderate-----	0.32			
	49-60	10-30	1.40-1.65	0.2-0.6	0.18-0.22	6.1-8.4	Moderate-----	0.32			
Bk-------------- Beckville	0-5	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
	5-31	7-18	1.30-1.50	2.0-6.0	0.13-0.19	6.6-7.8	Low----------	0.32			
	31-60	7-18	1.30-1.60	2.0-6.0	0.11-0.18	7.4-8.4	Low----------	0.32			
BmB2------------ Billett	0-8	5-15	1.40-1.70	2.0-6.0	0.13-0.18	4.5-7.8	Low----------	0.20	4	3	1-2
	8-37	6-18	1.40-1.70	2.0-6.0	0.10-0.17	4.5-7.3	Low----------	0.20			
	37-45	3-10	1.50-1.70	2.0-6.0	0.07-0.14	5.1-7.3	Low----------	0.20			
	45-60	1-5	1.60-1.70	6.0-20	0.03-0.10	5.1-7.8	Low----------	0.10			
BnC2------------ Billett	0-8	7-15	1.40-1.70	2.0-6.0	0.13-0.18	5.6-7.3	Low----------	0.20	5	3	1-2
	8-37	10-18	1.40-1.70	2.0-6.0	0.10-0.15	5.1-7.3	Low----------	0.20			
	37-45	8-18	1.50-1.80	2.0-6.0	0.05-0.12	5.6-7.3	Low----------	0.20			
	45-60	2-7	1.60-1.90	6.0-20	0.02-0.10	5.1-7.8	Low----------	0.10			
BoA------------- Blount	0-11	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.43	3	6	2-4
	11-36	35-50	1.40-1.70	0.2-0.6	0.12-0.19	4.5-7.8	Moderate-----	0.43			
	36-41	22-38	1.50-1.70	0.2-0.6	0.12-0.19	6.1-8.4	Moderate-----	0.43			
	41-60	22-30	1.60-1.85	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.43			
BpD2*:											
Boyer-----------	0-8	5-15	1.15-1.60	2.0-6.0	0.11-0.13	5.6-7.3	Low----------	0.24	4	8	1-2
	8-35	10-18	1.25-1.60	2.0-6.0	0.11-0.13	5.6-7.8	Low----------	0.24			
	35-60	0-10	1.20-1.45	>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		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
BpD2*:											
Mudlavia--------	0-7	10-20	1.30-1.40	0.6-2.0	0.12-0.20	5.6-7.3	Low----------	0.28	2	8	1-2
	7-46	35-55	1.45-1.70	0.6-2.0	0.02-0.08	4.5-7.3	Moderate-----	0.28			
	46-60	1-7	1.65-1.70	>20	0.01-0.03	7.4-8.4	Low----------	0.10			
BrA--------------	0-14	20-27	1.25-1.50	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.28	5	6	4-5
Brenton	14-28	25-35	1.30-1.55	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
	28-52	20-30	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.8	Moderate-----	0.28			
	52-60	15-30	1.50-1.70	0.6-2.0	0.11-0.20	5.6-8.4	Low----------	0.28			
BsA--------------	0-15	20-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	3-5
Brenton	15-38	25-35	1.35-1.60	0.6-2.0	0.18-0.22	5.6-6.5	Moderate-----	0.43			
	38-48	12-20	1.55-1.65	0.6-2.0	0.13-0.17	6.1-7.3	Low----------	0.24			
	48-58	8-18	1.60-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.17			
	58-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
BwA--------------	0-13	20-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	3-5
Brenton	13-36	25-35	1.35-1.60	0.6-2.0	0.18-0.22	5.6-6.5	Moderate-----	0.43			
	36-46	12-20	1.55-1.65	0.6-2.0	0.13-0.17	6.1-7.3	Low----------	0.24			
	46-55	8-18	1.60-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.17			
	55-60	27-40	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
CaB2-------------	0-8	14-18	1.35-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-2
Cadiz	8-29	22-35	1.55-1.65	0.6-2.0	0.18-0.22	5.6-7.3	Moderate-----	0.37			
	29-36	27-35	1.55-1.65	0.2-0.6	0.11-0.19	6.1-7.3	Moderate-----	0.37			
	36-60	22-30	1.55-1.75	0.2-0.6	0.05-0.19	7.4-8.4	Moderate-----	0.37			
CbA, CbB2--------	0-7	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	7-38	22-35	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	Moderate-----	0.37			
	38-53	18-30	1.45-1.65	0.6-2.0	0.11-0.22	5.6-7.3	Low----------	0.37			
	53-60	5-20	1.55-1.75	0.6-6.0	0.11-0.22	5.6-8.4	Low----------	0.37			
CdB2-------------	0-8	18-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	1-2
Camden	8-35	27-35	1.55-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	35-50	10-20	1.45-1.60	0.6-2.0	0.11-0.19	5.6-7.3	Low----------	0.37			
	50-57	8-18	1.50-1.70	0.6-2.0	0.15-0.21	5.6-7.8	Low----------	0.24			
	57-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
CfA--------------	0-16	10-20	1.40-1.55	0.6-2.0	0.13-0.20	5.1-7.8	Low----------	0.28	4	5	2-3
Carmi	16-25	15-22	1.45-1.65	2.0-6.0	0.12-0.19	4.5-6.0	Low----------	0.20			
	25-60	5-15	1.60-1.70	6.0-20	0.02-0.07	5.1-8.4	Low----------	0.15			
Cg, Cs-----------	0-9	18-27	1.30-1.40	0.6-2.0	0.22-0.24	6.6-7.8	Low----------	0.24	5	6	4-10
Comfrey	9-30	18-27	1.30-1.40	0.6-2.0	0.22-0.24	6.6-7.8	Low----------	0.24			
	30-45	18-35	1.40-1.65	0.6-2.0	0.14-0.19	6.6-7.8	Moderate-----	0.32			
	45-60	10-18	1.50-1.70	0.6-2.0	0.16-0.21	6.6-8.4	Low----------	0.32			
CtB2-------------	0-10	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
Corwin	10-38	25-35	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.28			
	38-60	10-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Cz---------------	0-14	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
Cyclone	14-48	27-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.43			
	48-55	15-25	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.8	Low----------	0.43			
	55-60	15-30	1.50-1.80	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.43			
Dw*:											
Drummer----------	0-14	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate-----	0.28	5	7	4-7
	14-41	20-35	1.20-1.45	0.6-2.0	0.21-0.24	5.6-7.8	Moderate-----	0.28			
	41-50	22-33	1.30-1.55	0.6-2.0	0.17-0.20	6.1-8.4	Moderate-----	0.28			
	50-60	15-32	1.40-1.70	0.6-2.0	0.11-0.19	6.6-8.4	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 erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Dw*:											
Drummer, stratified sandy substratum-----	0-12	27-35	1.10-1.40	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	7	4-7
	12-45	27-35	1.20-1.45	0.6-2.0	0.20-0.22	6.1-7.8	Moderate-----	0.28			
	45-57	15-27	1.30-1.55	0.6-2.0	0.17-0.20	6.6-8.4	Low----------	0.28			
	57-60	5-15	1.65-1.70	0.6-6.0	0.05-0.14	7.4-8.4	Low----------	0.20			
Dx-------------- Drummer	0-15	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7	4-7
	15-52	27-35	1.20-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
	52-61	18-30	1.30-1.55	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.28			
	61-80	1-8	1.80-2.10	>20	0.02-0.04	6.6-8.4	Low----------	0.10			
Dy-------------- Du Page	0-26	18-27	1.40-1.60	0.6-2.0	0.22-0.24	6.6-8.4	Moderate-----	0.28	5	6	2-5
	26-60	18-27	1.45-1.65	0.6-2.0	0.10-0.20	7.4-8.4	Low----------	0.28			
EdB2------------ Eldean	0-8	15-25	1.30-1.50	0.6-2.0	0.15-0.18	5.6-7.3	Low----------	0.28	4	8	1-3
	8-30	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate-----	0.37			
	30-37	25-45	1.30-1.60	0.6-2.0	0.07-0.14	6.6-8.4	Low----------	0.37			
	37-60	2-8	1.55-1.70	>20	0.01-0.04	7.4-8.4	Low----------	0.10			
EgA------------- Eldean	0-9	15-25	1.30-1.50	0.6-2.0	0.18-0.22	5.6-7.3	Low----------	0.37	4	5	1-3
	9-29	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate-----	0.37			
	29-39	25-45	1.30-1.60	0.6-2.0	0.07-0.14	6.6-8.4	Low----------	0.37			
	39-60	2-8	1.55-1.70	>20	0.01-0.04	7.4-8.4	Low----------	0.10			
EvA------------- Elston	0-19	8-15	1.35-1.45	2.0-6.0	0.12-0.15	4.5-7.3	Low----------	0.20	4	3	2-5
	19-25	10-18	1.35-1.60	2.0-6.0	0.12-0.18	5.1-6.0	Low----------	0.20			
	25-70	4-10	1.45-1.65	6.0-20	0.08-0.13	5.1-6.0	Low----------	0.20			
	70-80	1-8	1.60-1.75	>20	0.05-0.07	5.6-8.4	Low----------	0.15			
GgA------------- Gilboa	0-12	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	3-5
	12-18	27-35	1.55-1.65	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	18-45	22-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	45-52	18-27	1.55-1.70	0.2-0.6	0.13-0.19	6.6-7.8	Low----------	0.37			
	52-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
GhB2------------ Glenhall	0-8	15-22	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	2-4
	8-32	27-35	1.55-1.65	0.6-2.0	0.13-0.19	5.6-6.5	Moderate-----	0.28			
	32-43	19-25	1.40-1.50	0.6-2.0	0.14-0.19	5.6-6.5	Low----------	0.28			
	43-50	15-25	1.65-1.75	0.6-2.0	0.09-0.12	6.1-7.3	Low----------	0.17			
	50-60	8-18	1.65-1.75	2.0-6.0	0.08-0.14	7.4-8.4	Low----------	0.17			
GkB2------------ Glenhall	0-7	15-22	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	5	2-4
	7-35	27-35	1.55-1.65	0.6-2.0	0.13-0.20	5.1-6.5	Moderate-----	0.43			
	35-45	24-30	1.65-1.75	0.6-2.0	0.12-0.16	6.1-7.3	Moderate-----	0.24			
	45-55	8-18	1.65-1.75	2.0-6.0	0.09-0.12	6.6-8.4	Low----------	0.17			
	55-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
GoF------------- Gosport	0-4	18-27	1.30-1.40	0.2-0.6	0.13-0.19	5.1-6.5	Low----------	0.28	4	8	1-2
	4-30	36-40	1.50-1.60	0.06-0.2	0.11-0.14	4.5-5.5	High---------	0.32			
	30	---	---	---	---	---	-------------	----			
HeG------------- Hennepin	0-3	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	3-2	6	2-6
	3-13	18-30	1.30-1.60	0.2-0.6	0.14-0.22	6.1-8.4	Low----------	0.32			
	13-60	18-27	1.70-1.85	0.2-0.6	0.10-0.15	7.4-8.4	Low----------	0.32			
HfB------------- High Gap	0-8	18-27	1.50-1.70	0.6-2.0	0.22-0.24	4.5-6.0	Low----------	0.37	4	5	1-3
	8-30	28-35	1.50-1.70	0.6-2.0	0.15-0.19	4.5-6.0	Low----------	0.37			
	30-38	15-22	1.60-1.70	0.6-2.0	0.12-0.14	4.5-6.0	Low----------	0.37			
	38	---	---	---	---	---	-------------	----			

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
HhB2, HhC2------- High Gap Variant	0-8	18-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	4	6	1-3
	8-24	28-35	1.50-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate-----	0.37			
	24-31	32-40	1.50-1.65	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37			
	31-36	35-40	1.50-1.60	0.06-0.6	0.07-0.11	4.5-6.0	Moderate-----	0.37			
	36	---	---	---	---	---	-------------	----			
Hm, Ho----------- Houghton	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	-------------	----	5	2	>70
IoB2------------- Iona	0-9	10-27	1.30-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	5	1-4
	9-55	18-35	1.40-1.60	0.6-2.0	0.18-0.22	5.1-7.3	Moderate-----	0.37			
	55-60	10-27	1.30-1.40	0.6-2.0	0.20-0.22	7.4-8.4	Low----------	0.37			
IpA-------------- Ipava	0-12	20-30	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6	4-5
	12-30	35-43	1.25-1.50	0.2-0.6	0.11-0.20	5.6-7.8	High---------	0.43			
	30-60	20-27	1.30-1.55	0.2-0.6	0.20-0.22	6.1-8.4	Moderate-----	0.43			
Ju--------------- Jules	0-10	10-20	1.15-1.40	0.6-2.0	0.20-0.24	7.4-8.4	Low----------	0.37	5	4L	1-3
	10-60	18-27	1.30-1.55	0.6-2.0	0.17-0.22	7.4-8.4	Moderate-----	0.43			
LcA-------------- Lafayette	0-13	15-25	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	2-4
	13-33	25-35	1.35-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Moderate-----	0.43			
	33-47	22-30	1.35-1.50	0.6-2.0	0.14-0.18	5.6-6.5	Moderate-----	0.32			
	47-61	15-22	1.60-1.80	0.6-2.0	0.08-0.12	6.1-7.3	Low----------	0.17			
	61-70	1-5	1.65-1.85	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
Ld--------------- La Hogue	0-11	10-27	1.40-1.60	0.6-2.0	0.20-0.24	6.1-7.3	Low----------	0.28	5	5	3-5
	11-43	18-35	1.50-1.70	0.6-2.0	0.12-0.20	5.1-7.3	Moderate-----	0.28			
	43-50	10-20	1.55-1.75	0.6-6.0	0.08-0.20	6.1-7.3	Low----------	0.20			
	50-60	5-20	1.60-1.80	0.6-6.0	0.05-0.22	5.6-7.8	Low----------	0.20			
Lk--------------- La Hogue	0-12	15-25	1.30-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.28	5	6	3-5
	12-40	20-30	1.55-1.65	0.6-2.0	0.15-0.19	5.1-6.5	Moderate-----	0.28			
	40-47	15-20	1.60-1.70	0.6-2.0	0.09-0.13	5.6-7.3	Low----------	0.28			
	47-55	8-18	1.50-1.70	0.6-2.0	0.08-0.13	6.6-7.8	Low----------	0.28			
	55-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Lp*:											
Landes-----------	0-11	7-20	1.40-1.60	2.0-6.0	0.13-0.20	6.1-8.4	Low----------	0.20	4	3	1-2
	11-38	5-18	1.60-1.70	2.0-6.0	0.10-0.15	6.1-8.4	Low----------	0.32			
	38-60	5-18	1.60-1.80	6.0-20	0.05-0.15	6.1-8.4	Low----------	0.20			
Chatterton-------	0-12	3-10	1.45-1.55	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	1-2
	12-24	3-10	1.60-1.70	6.0-20	0.10-0.12	5.6-7.8	Low----------	0.17			
	24-32	3-10	1.60-1.70	6.0-20	0.10-0.12	7.4-8.4	Low----------	0.17			
	32-60	2-5	1.75-1.85	6.0-20	0.06-0.08	7.4-8.4	Low----------	0.17			
MaB3------------- Markham	0-7	27-35	1.30-1.50	0.2-0.6	0.22-0.24	5.6-6.5	Moderate-----	0.37	2	7	1-2
	7-28	35-45	1.40-1.60	0.2-0.6	0.11-0.20	5.1-7.8	Moderate-----	0.37			
	28-60	22-30	1.60-1.75	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
McB2*:											
Markham----------	0-8	22-27	1.10-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	3	6	2-3
	8-38	35-45	1.40-1.60	0.2-0.6	0.11-0.20	5.1-7.8	Moderate-----	0.37			
	38-60	22-30	1.60-1.75	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
Symerton---------	0-10	20-27	1.15-1.30	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.32	5	6	3-4
	10-32	27-35	1.35-1.60	0.6-2.0	0.12-0.18	5.6-7.8	Moderate-----	0.32			
	32-60	22-30	1.45-1.70	0.2-0.6	0.05-0.19	6.6-8.4	Moderate-----	0.43			

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
MdA-------------	0-11	8-20	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	5	5	1-2
Martinsville	11-43	20-33	1.40-1.60	0.6-2.0	0.16-0.20	5.1-6.5	Moderate-----	0.37			
	43-56	15-25	1.40-1.60	0.6-2.0	0.12-0.17	5.1-6.5	Low----------	0.24			
	56-60	2-20	1.50-1.70	0.6-6.0	0.08-0.17	5.6-8.4	Low----------	0.24			
MdB2, MdC2-------	0-11	12-20	1.35-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	5	.5-2
Martinsville	11-43	20-33	1.40-1.60	0.6-2.0	0.16-0.20	5.1-6.5	Moderate-----	0.37			
	43-56	15-25	1.40-1.60	0.6-2.0	0.12-0.17	5.1-6.5	Low----------	0.24			
	56-60	2-20	1.50-1.70	0.6-6.0	0.08-0.17	5.6-8.4	Low----------	0.24			
MoE2-------------	0-7	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	4	5	1-2
Miami	7-19	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.37			
	19-29	20-27	1.45-1.65	0.6-2.0	0.14-0.19	6.6-7.8	Low----------	0.37			
	29-60	15-25	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
MpC3, MpD3-------	0-6	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37	3	6	.5-1
Miami	6-20	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	20-25	20-27	1.45-1.65	0.6-2.0	0.14-0.19	6.6-7.8	Low----------	0.37			
	25-60	15-25	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
Mr---------------	0-16	35-40	1.30-1.50	0.6-2.0	0.20-0.23	5.6-7.3	High---------	0.28	5	4	5-6
Milford	16-55	35-42	1.40-1.60	0.2-0.6	0.18-0.20	5.6-7.8	Moderate-----	0.43			
	55-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	6.6-8.4	Moderate-----	0.43			
MtA--------------	0-8	18-25	1.30-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	6	2-4
Millbrook	8-32	25-35	1.55-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	32-42	18-30	1.40-1.50	0.6-2.0	0.12-0.19	5.1-7.3	Low----------	0.32			
	42-57	8-18	1.65-1.75	0.6-2.0	0.09-0.12	6.1-8.4	Low----------	0.28			
	57-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
MuC2*:											
Montmorenci-----	0-8	15-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	4	5	2-4
	8-30	25-35	1.40-1.60	0.6-2.0	0.15-0.20	5.6-7.3	Moderate-----	0.32			
	30-35	25-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.32			
	35-60	14-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.32			
Barce-----------	0-10	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
	10-32	22-30	1.40-1.65	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.32			
	32-42	27-30	1.55-1.65	0.6-2.0	0.12-0.15	5.1-7.3	Moderate-----	0.32			
	42-50	18-27	1.55-1.70	0.2-0.6	0.14-0.19	6.6-7.8	Low----------	0.43			
	50-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			
MvE2-------------	0-7	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	4	6	2-3
Morley	7-29	27-50	1.60-1.80	0.2-0.6	0.07-0.12	5.1-8.4	Moderate-----	0.43			
	29-60	22-30	1.60-1.80	0.2-0.6	0.05-0.10	6.1-8.4	Moderate-----	0.43			
MwC3-------------	0-7	27-35	1.40-1.60	0.2-0.6	0.18-0.22	5.1-7.3	Moderate-----	0.37	3	7	1-2
Morley	7-24	27-50	1.60-1.80	0.2-0.6	0.07-0.12	5.1-8.4	Moderate-----	0.43			
	24-60	22-30	1.60-1.80	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.43			
MxC2*:											
Morley----------	0-6	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	4	6	2-3
	6-29	27-50	1.60-1.80	0.2-0.6	0.07-0.12	5.1-8.4	Moderate-----	0.43			
	29-60	22-30	1.60-1.80	0.2-0.6	0.05-0.10	6.1-8.4	Moderate-----	0.43			
Cadiz-----------	0-7	14-18	1.35-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-2
	7-32	22-35	1.55-1.65	0.6-2.0	0.18-0.22	5.6-7.3	Moderate-----	0.37			
	32-39	27-35	1.55-1.65	0.2-0.6	0.11-0.19	6.1-7.3	Moderate-----	0.37			
	39-60	22-30	1.55-1.75	0.2-0.6	0.05-0.19	7.4-8.4	Moderate-----	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
MyA, MzB2--------- Mudlavia	0-7	10-20	1.30-1.40	0.6-2.0	0.13-0.21	5.6-7.3	Low-----------	0.28	2	8	1-4
	7-37	35-55	1.45-1.70	0.6-2.0	0.02-0.08	4.5-6.0	Moderate-----	0.28			
	37-54	45-55	1.45-1.70	0.6-2.0	0.02-0.08	6.1-7.3	Moderate-----	0.28			
	54-60	1-7	1.65-1.70	>20	0.01-0.03	7.4-8.4	Low-----------	0.10			
ObB2-------------- Ockley	0-8	10-20	1.40-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.32	5	5	1-2
	8-24	10-26	1.45-1.60	0.6-2.0	0.15-0.19	5.1-6.0	Low-----------	0.32			
	24-53	18-35	1.60-1.75	0.6-2.0	0.10-0.14	5.6-6.5	Moderate-----	0.24			
	53-60	0-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
OcA, OcB2--------- Ockley	0-9	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	Low-----------	0.37	5	5	1-2
	9-31	20-35	1.45-1.60	0.6-2.0	0.15-0.22	4.5-6.0	Moderate-----	0.37			
	31-60	20-35	1.40-1.55	0.6-2.0	0.06-0.11	5.6-7.3	Moderate-----	0.24			
	60-80	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
OpB--------------- Ormas	0-7	5-12	1.40-1.60	6.0-20	0.10-0.12	5.6-7.3	Low-----------	0.17	5	2	1-2
	7-37	3-10	1.45-1.60	6.0-20	0.07-0.09	5.6-6.5	Low-----------	0.17			
	37-72	15-25	1.50-1.60	2.0-6.0	0.11-0.14	5.1-7.8	Low-----------	0.32			
	72-80	1-8	1.55-1.70	>20	0.03-0.05	7.4-8.4	Low-----------	0.15			
OsA--------------- Oshtemo	0-9	8-15	1.30-1.60	2.0-6.0	0.10-0.13	5.1-6.5	Low-----------	0.15	5	3	1-3
	9-44	10-18	1.20-1.60	2.0-6.0	0.12-0.19	5.1-6.5	Low-----------	0.24			
	44-56	5-15	1.20-1.60	2.0-6.0	0.03-0.10	5.1-7.3	Low-----------	0.17			
	56-60	0-15	1.20-1.50	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
OsB--------------- Oshtemo	0-10	8-15	1.30-1.60	2.0-6.0	0.10-0.13	5.1-6.5	Low-----------	0.15	5	3	1-3
	10-41	10-18	1.20-1.60	2.0-6.0	0.12-0.19	5.1-6.5	Low-----------	0.24			
	41-58	5-15	1.20-1.60	2.0-6.0	0.03-0.10	5.1-7.3	Low-----------	0.17			
	58-60	0-15	1.20-1.50	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
Pm---------------- Peotone	0-21	33-40	1.20-1.40	0.2-0.6	0.12-0.23	5.6-7.8	High----------	0.28	5	4	5-7
	21-47	35-45	1.30-1.60	0.2-0.6	0.11-0.20	6.1-7.8	High----------	0.28			
	47-60	25-40	1.40-1.65	0.2-0.6	0.18-0.20	6.6-8.4	High----------	0.28			
Po---------------- Piankeshaw Variant	0-7	7-18	1.30-1.40	0.6-2.0	0.14-0.16	7.4-8.4	Low-----------	0.28	5	8	1-2
	7-45	7-18	1.40-1.50	2.0-6.0	0.03-0.04	7.4-8.4	Low-----------	0.28			
	45-60	7-18	1.60-1.70	2.0-6.0	0.02-0.03	7.4-8.4	Low-----------	0.17			
Pp*. Pits											
PrA, PrB2--------- Proctor	0-11	18-27	1.10-1.30	0.6-2.0	0.22-0.24	5.1-7.8	Low-----------	0.32	5	6	3-4
	11-35	25-35	1.20-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43			
	35-48	15-32	1.30-1.55	0.6-2.0	0.13-0.19	5.6-7.3	Moderate-----	0.43			
	48-60	15-32	1.40-1.70	0.6-6.0	0.07-0.19	5.6-7.8	Low-----------	0.43			
PuA, PuB2--------- Proctor	0-10	20-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.28	5	6	3-4
	10-31	27-35	1.40-1.60	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.43			
	31-45	10-20	1.40-1.50	0.6-2.0	0.15-0.19	5.6-7.3	Low-----------	0.32			
	45-55	8-18	1.60-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low-----------	0.24			
	55-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			
Rb---------------- Ragsdale	0-8	20-27	1.50-1.70	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.28	5	5	4-6
	8-48	20-30	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
	48-60	10-20	1.50-1.70	0.6-2.0	0.20-0.22	7.4-8.4	Low-----------	0.28			
RdA--------------- Rainsville	0-9	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	9-18	24-30	1.55-1.65	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	18-29	20-30	1.55-1.65	0.6-2.0	0.17-0.19	4.5-6.0	Moderate-----	0.37			
	29-46	20-30	1.55-1.65	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37			
	46-55	18-25	1.55-1.65	0.2-0.6	0.17-0.19	6.6-7.8	Low-----------	0.37			
	55-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
RfB2*:											
Rainsville------	0-8	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	8-13	24-30	1.55-1.65	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	13-30	20-30	1.55-1.65	0.6-2.0	0.17-0.19	4.5-6.0	Moderate-----	0.37			
	30-42	20-30	1.55-1.65	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37			
	42-48	18-25	1.55-1.65	0.2-0.6	0.17-0.19	6.6-7.8	Low----------	0.37			
	48-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Williamstown----	0-9	14-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	4	5	1-3
	9-30	27-35	1.35-1.50	0.6-2.0	0.15-0.21	5.6-7.3	Moderate-----	0.37			
	30-35	18-27	1.35-1.50	0.6-2.0	0.15-0.19	6.1-7.8	Low----------	0.37			
	35-60	16-26	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Rockfield-------	0-7	12-24	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	5	5	1-3
	7-27	20-32	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	27-52	20-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	52-60	18-27	1.45-1.65	0.2-0.6	0.17-0.19	6.6-8.4	Moderate-----	0.37			
	60-80	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
RlA-------------- Reesville	0-8	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.1-7.3	Low----------	0.37	5	5	2-4
	8-33	25-35	1.30-1.55	0.6-2.0	0.17-0.22	4.5-7.8	Moderate-----	0.37			
	33-60	20-25	1.30-1.60	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.37			
RoA, RoB2-------- Rockfield	0-13	12-24	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	5	5	1-2
	13-31	20-32	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	31-50	20-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	50-56	18-27	1.45-1.65	0.2-0.6	0.17-0.19	6.6-8.4	Moderate-----	0.37			
	56-60	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.9-8.4	Low----------	0.37			
RpG-------------- Rodman	0-6	8-25	1.20-1.50	2.0-6.0	0.10-0.12	6.6-7.8	Low----------	0.20	3	8	2-4
	6-15	5-25	1.10-1.50	2.0-6.0	0.09-0.12	6.6-7.8	Low----------	0.20			
	15-60	0-10	1.60-1.70	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
RtA, RtB2-------- 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	1-2
	10-37	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	37-54	20-30	1.40-1.55	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.37			
	54-60	15-25	1.40-1.55	0.6-2.0	0.10-0.16	5.1-7.8	Low----------	0.24			
	60-80	2-6	1.60-1.80	>20	0.02-0.04	6.6-8.4	Low----------	0.10			
Sb--------------- Sable	0-13	27-35	1.15-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7	5-6
	13-45	24-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.28			
	45-60	20-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	Low----------	0.28			
SeA-------------- Shadeland Variant	0-10	18-25	1.30-1.40	0.6-2.0	0.19-0.24	4.5-7.3	Low----------	0.37	4	6	1-3
	10-13	40-50	1.45-1.55	0.6-2.0	0.11-0.13	4.5-6.0	Moderate-----	0.37			
	13-29	35-45	1.55-1.65	0.2-0.6	0.10-0.18	4.5-6.5	Moderate-----	0.37			
	29-34	40-45	1.60-1.70	0.06-0.6	0.07-0.12	4.5-6.0	Moderate-----	0.37			
	34	---	---	---	---	---	-------------	----			
SlA-------------- Starks	0-8	18-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	1-3
	8-30	27-35	1.40-1.60	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	30-50	18-25	1.40-1.50	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	50-56	8-18	1.60-1.70	0.6-2.0	0.19-0.21	6.6-7.8	Low----------	0.24			
	56-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Sr*:											
Stonelick-------	0-9	10-22	1.20-1.45	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.32	5	5	1-3
	9-60	5-18	1.30-1.55	2.0-6.0	0.08-0.14	7.4-8.4	Low----------	0.24			
Moundhaven------	0-8	2-10	1.40-1.50	6.0-20	0.10-0.12	7.4-8.4	Low----------	0.17	5	2	1-2
	8-35	1-8	1.50-1.65	6.0-20	0.06-0.11	7.4-8.4	Low----------	0.17			
	35-60	0-5	1.55-1.70	6.0-20	0.05-0.10	7.4-8.4	Low----------	0.17			

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
StB3, StC3------- Strawn	0-7	27-30	1.35-1.55	0.6-2.0	0.17-0.19	5.6-7.3	Moderate-----	0.37	4	6	1-2
	7-13	27-35	1.35-1.55	0.6-2.0	0.15-0.20	5.6-7.8	Moderate-----	0.37			
	13-60	22-30	1.50-1.70	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
SyB*:											
Symerton--------	0-11	20-27	1.15-1.30	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.32	5	6	3-4
	11-39	27-35	1.35-1.60	0.6-2.0	0.12-0.18	5.6-7.8	Moderate-----	0.32			
	39-60	22-30	1.45-1.70	0.2-0.6	0.05-0.19	6.6-8.4	Moderate-----	0.43			
Varna-----------	0-11	20-27	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.28	5	6	3-4
	11-34	35-48	1.30-1.60	0.2-0.6	0.09-0.19	5.6-7.3	Moderate-----	0.37			
	34-60	22-30	1.50-1.70	0.2-0.6	0.05-0.19	6.6-8.4	Low----------	0.37			
TuC2, TwB2------- Tuscola	0-8	10-25	1.30-1.40	0.6-2.0	0.20-0.24	5.6-6.5	Low----------	0.37	5	5	1-2
	8-39	25-35	1.40-1.60	0.6-2.0	0.15-0.19	5.6-6.5	Moderate-----	0.37			
	39-49	15-25	1.40-1.60	0.6-2.0	0.12-0.14	5.6-7.3	Low----------	0.24			
	49-58	5-15	1.45-1.60	0.6-2.0	0.19-0.21	6.6-8.4	Low----------	0.37			
	58-60	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Ud*, Ur*. Udorthents											
Wc--------------- Wakeland Variant	0-6	7-18	1.30-1.40	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	5	5	2-4
	6-31	7-18	1.45-1.55	0.6-2.0	0.20-0.22	6.6-7.8	Low----------	0.43			
	31-45	7-18	1.45-1.55	0.6-2.0	0.20-0.22	7.4-8.4	Low----------	0.43			
	45-60	7-18	1.60-1.70	2.0-6.0	0.17-0.19	7.4-8.4	Low----------	0.43			
We--------------- Wallkill Variant	0-9	27-35	1.30-1.40	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.28	5	7	4-10
	9-31	35-45	1.45-1.60	0.2-0.6	0.13-0.22	5.1-7.3	Moderate-----	0.37			
	31-60	---	0.25-0.45	0.2-6.0	0.35-0.45	5.6-7.3	-------------	----			
Wg--------------- Warners Variant	0-16	40-45	1.35-1.55	0.2-0.6	0.12-0.14	6.1-7.3	Moderate-----	0.28	3	4	4-12
	16-35	35-45	1.50-1.60	0.06-0.6	0.11-0.20	6.6-7.3	Moderate-----	0.28			
	35-48	---	---	---	0.18-0.25	7.4-8.4	Low----------	----			
	48-60	5-15	1.65-1.80	2.0-6.0	0.14-0.16	7.4-8.4	Low----------	0.24			
Wh--------------- 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	3-7
	8-22	15-27	1.30-1.50	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.37			
	22-60	25-35	1.40-1.60	0.06-0.2	0.15-0.20	6.1-7.3	Moderate-----	0.37			
WlA-------------- Waupecan	0-12	15-27	1.15-1.30	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.32	5	6	2-4
	12-34	25-35	1.30-1.50	0.6-2.0	0.18-0.22	5.6-7.3	Moderate-----	0.43			
	34-62	10-25	1.55-1.75	2.0-6.0	0.08-0.18	5.6-7.3	Low----------	0.10			
	62-80	3-10	1.60-1.80	>20	0.02-0.04	6.6-8.4	Low----------	0.10			
WpG-------------- Weikert Variant	0-5	10-18	1.45-1.55	2.0-6.0	0.14-0.17	4.5-6.0	Low----------	0.24	4	3	1-3
	5-27	10-18	1.55-1.65	2.0-6.0	0.10-0.15	5.1-6.0	Low----------	0.17			
	27	---	---	---	---	---	-------------	----			
WrA*:											
Williamsport----	0-11	20-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	3-5
	11-30	35-47	1.55-1.65	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43			
	30-44	20-27	1.40-1.50	0.6-2.0	0.14-0.19	5.6-7.3	Low----------	0.32			
	44-51	24-32	1.55-1.65	0.2-0.6	0.18-0.20	6.6-8.4	Moderate-----	0.43			
	51-60	24-30	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.43			
Elliott---------	0-10	24-27	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	4	6	4-5
	10-42	35-50	1.30-1.60	0.2-0.6	0.11-0.20	5.6-7.8	Moderate-----	0.28			
	42-60	22-30	1.60-1.75	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.43			

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
WtC2*:											
Williamstown----	0-7	14-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	4	5	1-3
	7-29	27-35	1.35-1.50	0.6-2.0	0.15-0.21	5.6-7.3	Moderate-----	0.37			
	29-34	18-27	1.35-1.50	0.6-2.0	0.15-0.19	6.1-7.8	Low----------	0.37			
	34-60	16-26	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Rainsville------	0-8	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	8-32	20-30	1.55-1.65	0.6-2.0	0.17-0.19	4.5-6.0	Moderate-----	0.37			
	32-40	20-30	1.55-1.65	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37			
	40-46	18-25	1.55-1.65	0.2-0.6	0.17-0.19	6.6-7.8	Low----------	0.37			
	46-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	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				
AfB2: Alford	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
Am: Armiesburg Variant	B	Frequent	Very brief to long.	Dec-Jun	>6.0	---	---	>60	---	High	Moderate	Low.
BbA: Barce	B	None	---	---	3.0-4.0	Apparent	Dec-May	>60	---	Moderate	High	Moderate.
BdB2*:												
Barce	B	None	---	---	3.0-4.0	Apparent	Dec-May	>60	---	Moderate	High	Moderate.
Montmorenci	B	None	---	---	2.0-4.0	Apparent	Dec-May	>60	---	Moderate	High	Moderate.
Be: Beaucoup	B/D	Frequent	Long	Mar-Jun	+.5-2.0	Apparent	Mar-Jun	>60	---	High	High	Low.
Bk: Beckville	B	Occasional	Very brief	Jan-May	1.5-3.0	Apparent	Jan-May	>60	---	High	Low	Low.
EmB2: Billett	B	None	---	---	3.0-6.0	Apparent	Nov-Apr	>60	---	Moderate	Low	Moderate.
BnC2: Billett	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
BoA: Blount	C	None	---	---	1.0-3.0	Perched	Jan-May	>60	---	High	High	High.
BpD2*:												
Boyer	B	None	---	---	>6.0	---	---	>60	---	Low	Low	Moderate.
Mudlavia	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
BrA: Brenton	B	None	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
BsA, BwA: Brenton	B	None	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High	High	Moderate.
CaB2: Cadiz	B	None	---	---	2.5-6.0	Apparent	Nov-Jun	>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				
CbA, CbB2--------- Camden	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
CdB2-------------- Camden	B	None--------	---	---	3.5-6.0	Apparent	Mar-May	>60	---	High-----	High-----	Moderate.
CfA--------------- Carmi	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Cg---------------- Comfrey	B/D	Rare--------	---	---	+.5-1.0	Apparent	Dec-Jun	>60	---	High-----	High-----	Low.
Cs---------------- Comfrey	B/D	Frequent----	Very brief to brief.	Mar-Jun	+.5-1.0	Apparent	Dec-Jun	>60	---	High-----	High-----	Low.
CtB2-------------- Corwin	B	None--------	---	---	2.0-4.0	Apparent	Jan-Apr	>60	---	Moderate	High-----	Moderate.
Cz---------------- Cyclone	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Dw*: Drummer----------	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Drummer, stratified sandy substratum------	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Dx---------------- Drummer	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Dy---------------- Du Page	B	Frequent----	Very brief to long.	Jan-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
EdB2, EgA--------- Eldean	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
EvA--------------- Elston	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.
GgA--------------- Gilboa	B	None--------	---	---	1.0-3.0	Apparent	Dec-May	>60	---	Moderate	High-----	Moderate.
GhB2, GkB2-------- Glenhall	B	None--------	---	---	2.5-3.5	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.
GoF--------------- Gosport	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	High.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
HeG----------------- Hennepin	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low-------	Low.
HfB----------------- High Gap	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
HhB2, HhC2--------- High Gap Variant	B	None---------	---	---	2.0-3.5	Perched	Jan-May	20-40	Soft	Moderate	High------	High.
Hm, Ho------------- Houghton	A/D	None---------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High------	High------	Low.
IoB2--------------- Iona	B	None---------	---	---	2.0-3.5	Apparent	Dec-Apr	>60	---	High------	High------	Moderate.
IpA----------------- Ipava	B	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High------	High------	Moderate.
Ju------------------ Jules	B	Frequent-----	Very brief to long.	Mar-Jun	>6.0	---	---	>60	---	High------	Moderate	Low.
LcA----------------- Lafayette	B	None---------	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High------	High------	Moderate.
Ld------------------ La Hogue	B	None---------	---	---	1.0-3.0	Apparent	Feb-Jun	>60	---	High------	High------	Moderate.
Lk------------------ La Hogue	B	None---------	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High------	High------	Moderate.
Lp*:												
Landes------------	B	Frequent-----	Very brief	Jan-Jun	>6.0	---	---	>60	---	Moderate	Low-------	Low.
Chatterton--------	A	Frequent-----	Very brief	Jan-Jun	>6.0	---	---	>60	---	Low-------	Low-------	Moderate.
MaB3--------------- Markham	C	None---------	---	---	3.0-6.0	Perched	Mar-May	>60	---	High------	Moderate	Moderate.
McB2*:												
Markham-----------	C	None---------	---	---	3.0-6.0	Perched	Mar-May	>60	---	High------	Moderate	Moderate.
Symerton----------	B	None---------	---	---	3.5-6.0	Apparent	Mar-May	>60	---	Moderate	High------	Moderate.
MdA, MdB2, MdC2---- Martinsville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MoE2, MpC3, MpD3--- 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: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
Mr-----------------Milford	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
MtA---------------Millbrook	B	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
MuC2*:												
Montmorenci------	B	None---------	---	---	2.0-4.0	Apparent	Dec-May	>60	---	Moderate	High-----	Moderate.
Barce------------	B	None---------	---	---	3.0-4.0	Apparent	Dec-May	>60	---	Moderate	High-----	Moderate.
MvE2, MwC3--------Morley	C	None---------	---	---	3.0-6.0	Perched	Mar-May	>60	---	Moderate	High-----	Moderate.
MxC2*:												
Morley-----------	C	None---------	---	---	3.0-6.0	Perched	Mar-May	>60	---	Moderate	High-----	Moderate.
Cadiz------------	B	None---------	---	---	2.5-6.0	Perched	Nov-Jun	>60	---	High-----	Moderate	Moderate.
MyA, MzB2---------Mudlavia	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	High.
ObB2, OcA, OcB2---Ockley	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
OpB---------------Ormas	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
OsA, OsB----------Oshtemo	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Pm----------------Peotone	B/D	None---------	---	---	+.5-1.0	Apparent	Feb-Jul	>60	---	High-----	High-----	Moderate.
Po----------------Piankeshaw Variant	B	Rare---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Pp*. Pits												
PrA, PrB2---------Proctor	B	None---------	---	---	2.5-6.0	Apparent	Jan-May	>60	---	High-----	Moderate	Moderate.
PuA, PuB2---------Proctor	B	None---------	---	---	2.5-3.5	Apparent	Jan-May	>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: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
Rb: Ragsdale	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
RdA: Rainsville	B	None	---	---	2.5-4.0	Apparent	Dec-May	>60	---	Moderate	Moderate	Moderate.
RfE2*:												
Rainsville	B	None	---	---	2.5-4.0	Apparent	Dec-May	>60	---	Moderate	Moderate	Moderate.
Williamstown	C	None	---	---	1.5-3.5	Perched	Jan-Apr	>60	---	Moderate	Moderate	Low.
Rockfield	B	None	---	---	2.5-4.0	Apparent	Dec-Apr	>60	---	High	High	Moderate.
RlA: Reesville	C	None	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
RoA, RoB2: Rockfield	B	None	---	---	2.5-4.0	Apparent	Dec-Apr	>60	---	High	High	Moderate.
RpG: Rodman	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
RtA, RtB2: Rush	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
Sb: Sable	B/D	None	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High	High	Low.
SeA: Shadeland Variant	C	None	---	---	1.0-2.0	Perched	Jan-Apr	20-40	Soft	High	High	Moderate.
SlA: Starks	C	None	---	---	1.0-3.0	Apparent	Dec-May	>60	---	High	High	Moderate.
Sr*:												
Stonelick	B	Frequent	Very brief to long.	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low	Low.
Moundhaven	A	Frequent	Very brief to long.	Nov-May	>6.0	---	---	>60	---	Low	Low	Low.
StB3, StC3: Strawn	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
SyB*:												
Symerton	B	None	---	---	3.5-6.0	Apparent	Mar-May	>60	---	Moderate	High	Moderate.
Varna	C	None	---	---	3.0-6.0	Perched	Mar-May	>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				
TuC2, TwB2-------- Tuscola	B	None--------	---	---	2.0-4.0	Apparent	Feb-Jun	>60	---	Moderate	Moderate	Moderate.
Ud*, Ur*. Udorthents												
Wc---------------- Wakeland Variant	B	Occasional	Very brief	Oct-Jun	1.0-3.0	Apparent	Jan-May	>60	---	High-----	High-----	Low.
We---------------- Wallkill Variant	C/D	None--------	---	---	+1-1.0	Apparent	Feb-Jun	>60	---	High-----	High-----	Moderate.
Wg---------------- Warners Variant	D	None--------	---	---	+1-1.0	Apparent	Dec-Jul	>60	---	High-----	Moderate	Low.
Wh---------------- Washtenaw	C/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
WlA--------------- Waupecan	B	None--------	---	---	3.0-6.0	Apparent	Mar-May	>60	---	High-----	Moderate	Moderate.
WpG--------------- Weikert Variant	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Low------	Moderate.
WrA*: Williamsport-----	C	None--------	---	---	1.0-3.0	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.
Elliott----------	C	None--------	---	---	1.0-3.0	Apparent	Mar-May	>60	---	High-----	High-----	Moderate.
WtC2*: Williamstown-----	C	None--------	---	---	1.5-3.5	Perched	Jan-Apr	>60	---	Moderate	Moderate	Low.
Rainsville-------	B	None--------	---	---	2.5-4.0	Apparent	Dec-May	>60	---	Moderate	Moderate	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
Armiesburg Variant	Fine, mixed, mesic Fluventic Hapludolls
Barce	Fine-loamy, mixed, mesic Typic Argiudolls
Beaucoup	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Beckville	Coarse-loamy, mixed, nonacid, mesic Aquic Udifluvents
Billett	Coarse-loamy, mixed, mesic Mollic Hapludalfs
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Boyer	Coarse-loamy, mixed, mesic Typic Hapludalfs
Brenton	Fine-silty, mixed, mesic Aquic Argiudolls
Cadiz	Fine-silty, mixed, mesic Typic Hapludalfs
Camden	Fine-silty, mixed, mesic Typic Hapludalfs
Carmi	Coarse-loamy, mixed, mesic Typic Hapludolls
Chatterton	Sandy, mixed, mesic Fluventic Hapludolls
Comfrey	Fine-loamy, mixed, mesic Cumulic Haplaquolls
Corwin	Fine-loamy, mixed, mesic Typic Argiudolls
Cyclone	Fine-silty, mixed, mesic Typic Argiaquolls
Drummer	Fine-silty, mixed, mesic Typic Haplaquolls
Du Page	Fine-loamy, mixed, mesic Cumulic Hapludolls
Eldean	Fine, mixed, mesic Typic Hapludalfs
Elliott	Fine, illitic, mesic Aquic Argiudolls
*Elston	Coarse-loamy, mixed, mesic Typic Argiudolls
Gilboa	Fine-loamy, mixed, mesic Aquic Argiudolls
Glenhall	Fine-loamy, mixed, mesic Mollic Hapludalfs
Gosport	Fine, illitic, mesic Typic Dystrochrepts
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
High Gap	Fine-loamy, mixed, mesic Typic Hapludalfs
High Gap Variant	Fine-loamy, mixed, mesic Ultic Hapludalfs
Houghton	Euic, mesic Typic Medisaprists
*Iona	Fine-silty, mixed, mesic Typic Hapludalfs
Ipava	Fine, montmorillonitic, mesic Aquic Argiudolls
*Jules	Coarse-silty, mixed (calcareous), mesic Typic Udifluvents
Lafayette	Fine-silty, mixed, mesic Aquic Argiudolls
La Hogue	Fine-loamy, mixed, mesic Aquic Argiudolls
Landes	Coarse-loamy, mixed, mesic Fluventic Hapludolls
Markham	Fine, illitic, mesic Mollic Hapludalfs
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Millbrook	Fine-silty, mixed, mesic Udollic Ochraqualfs
*Montmorenci	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Morley	Fine, illitic, mesic Typic Hapludalfs
Moundhaven	Sandy, mixed, mesic Typic Udifluvents
Mudlavia	Clayey-skeletal, mixed, mesic Typic Hapludalfs
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Ormas	Loamy, mixed, mesic Arenic Hapludalfs
Oshtemo	Coarse-loamy, mixed, mesic Typic Hapludalfs
Peotone	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Piankeshaw Variant	Loamy-skeletal, mixed (calcareous), mesic Typic Udifluvents
Proctor	Fine-silty, mixed, mesic Typic Argiudolls
*Ragsdale	Fine-silty, mixed, mesic Typic Argiaquolls
Rainsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Rockfield	Fine-silty, mixed, mesic Typic Hapludalfs
Rodman	Sandy-skeletal, mixed, mesic Typic Hapludolls
Rush	Fine-silty, mixed, mesic Typic Hapludalfs
Sable	Fine-silty, mixed, mesic Typic Haplaquolls
Shadeland Variant	Fine, mixed, mesic Aeric Ochraqualfs
Starks	Fine-silty, mixed, mesic Aeric Ochraqualfs
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Strawn	Fine-loamy, mixed, mesic Typic Hapludalfs
Symerton	Fine-loamy, mixed, mesic Typic Argiudolls

TABLE 19.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
*Tuscola	Fine-loamy, mixed, mesic Aquic Hapludalfs
Udorthents	Loamy Udorthents
Varna	Fine, illitic, mesic Typic Argiudolls
Wakeland Variant	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Wallkill Variant	Fine, mixed, mesic Cumulic Haplaquolls
Warners Variant	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
*Washtenaw	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Waupecan	Fine-silty, mixed, mesic Typic Argiudolls
Weikert Variant	Coarse-loamy, mixed, mesic Dystric Eutrochrepts
Williamsport	Fine, mixed, mesic Aquic Argiudolls
*Williamstown	Fine-loamy, mixed, mesic Aquic Hapludalfs

*U.S. GOVERNMENT PRINTING OFFICE: 1991-281-364/20052

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