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 Wells County, Indiana

How To Use This Soil Survey

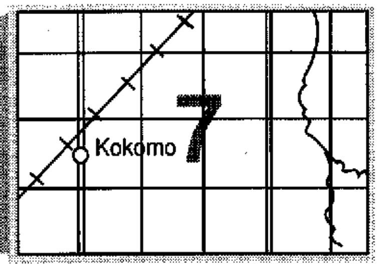
General Soil Map

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

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

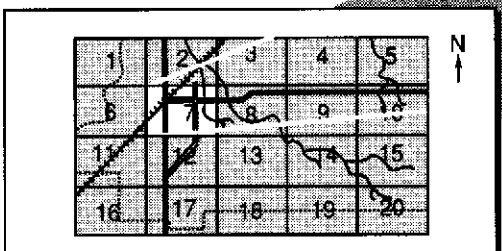
Detailed Soil Maps

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



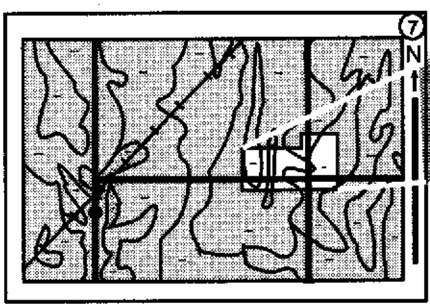
MAP SHEET

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

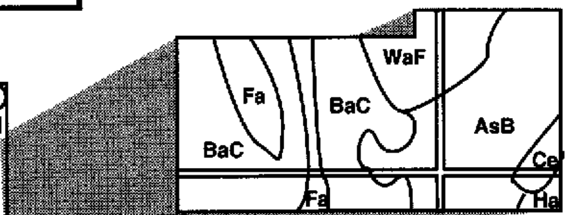


INDEX TO MAP SHEETS

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



MAP SHEET



AREA OF INTEREST

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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. 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, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, State Soil Conservation Board and Division of Soil Conservation. It is part of the technical assistance furnished to the Wells County Soil and Water Conservation District. Financial assistance was made available by the Wells County Board of Commissioners.

Cover: An area of Del Rey-Blount silt loams, 0 to 1 percent slopes, used for corn and soybeans, which are the major crops in Wells County.

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Issued April 1992

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Wells 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.

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State Conservationist
Soil Conservation Service

Soil Survey of Wells County, Indiana

By Travis Neely, Soil Conservation Service

Fieldwork by Travis Neely, Mac H. Robards, Donald R. Ruesch, and Larry R. Staley, Soil Conservation Service; and Noel P. Anderson, Roxann C. Klika, and David K. Lefforge, 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 Indiana Department of Natural Resources, State Soil Conservation Board and Division of Soil Conservation

Wells County is in the northeastern part of Indiana (fig. 1). It has a total land area of 236,900 acres, or 370 square miles. The county is about 24 miles from north to south and 14 miles from east to west. It was organized in 1838. The city of Bluffton, the county seat, had a population of about 8,705 in 1980. The total population of the county was about 25,401.

Most of the soils in the county are on uplands and are nearly level to strongly sloping. The bottom land, including that along the Salamonie and Wabash Rivers, generally is nearly level to moderately sloping. Elevation ranges from 772 to 935 feet above sea level.

Farming is the main enterprise in the county. Grain for cash is the main crop. Swine operations are most common, but some beef and dairy cattle and poultry also are raised. About 9,000 acres of woodland in the county provides raw material for forest products.

An older soil survey of Wells County was published in 1915 *(4)*. The present survey updates the earlier one and provides additional information and larger maps that show the soils in greater detail.

General Nature of the County

This section gives general information concerning the county. It discusses physiography, relief, and drainage; water supply; transportation; agricultural industries; population and land use; and climate.

Physiography, Relief, and Drainage

The highest point in Wells County is 935 feet above sea level. It is in the southeastern part of the county, on the county line between Nottingham Township and Jay County. The lowest point is 772 feet above sea level. It is in the northwestern corner of Union Township where Eight-Mile Creek leaves the county, near the Allen County line.

Most of Wells County is drained by major streams that originate in different parts of the county but all flow in a northwesterly direction. The northern part is drained by Eight-Mile Creek, Wabash River, and their tributaries. A small area in the northeastern part is drained by tributaries of St. Mary's River. The central and southern parts are drained by the Wabash River and its tributaries. The southwestern part is drained by the Salamonie River and its tributaries.

Water Supply

The water for farms, homes, and industries in the county is supplied by wells that can provide water at an average rate of 200 to 400 gallons per minute. The depth to a good source of ground water averages about 75 feet, but it ranges from as little as 25 feet to as much as 150 feet. Three public water systems serve about 8,800 people in the cities of Bluffton, Ossian, and Markle. Most of this water is supplied by wells that have

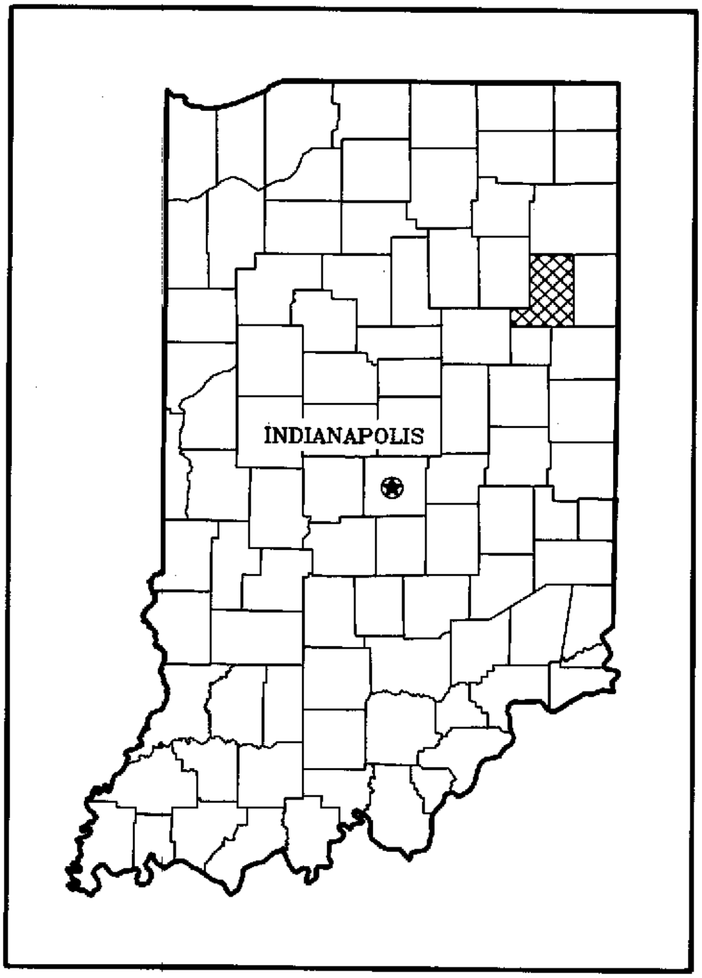

Figure 1.—Location of Wells County in Indiana.

been drilled into Silurian bedrock. Some of the water for Bluffton also is supplied by the Wabash River, which flows through the city.

Transportation

About 130 miles of Federal, Interstate, and State highways cross the county. There are also about 690 miles of county roads. All of these roads can be used year round, and most are paved.

A small airport, located 4 miles west of Bluffton, near Liberty Center, provides service for private airplanes.

The Norfolk Southern Railroad passes through the county in both north-south and east-west directions.

Agricultural Industries

One agricultural limestone plant and three meat processing plants are in the county. Several dealerships for farm implements, fertilizer, and seed and four firms that construct buildings for farms also are in the county.

Population and Land Use

The population of Wells County was about 25,401 in 1980, or about 69 people per square mile. The population increased 6.4 percent between 1970 and 1980.

The acreage of agricultural land, which includes that used for crops, pasture, and woodland, decreased about 1 percent between 1974 and 1978 *(7)*. During this period, the acreage of cropland increased and that of pasture and woodland decreased. In 1978 about 90 percent of the county was used for agriculture.

Climate

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Berne in the period 1951 to 1981. 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. The lowest temperature on record, which occurred at Berne on January 16, 1972, is -20 degrees. In summer, the average temperature is 72 degrees and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred at Berne on August 31, 1951, is 102 degrees.

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

The total annual precipitation is about 37 inches. Of this, 22 inches, or about 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 4.88 inches at Berne on September 20, 1957. Thunderstorms occur on about 40 days each year.

The average seasonal snowfall is about 33 inches. The greatest snow depth at any one time during the period of record was 22 inches. On the average, 28 days of the year have at least 1 inch of snow on the

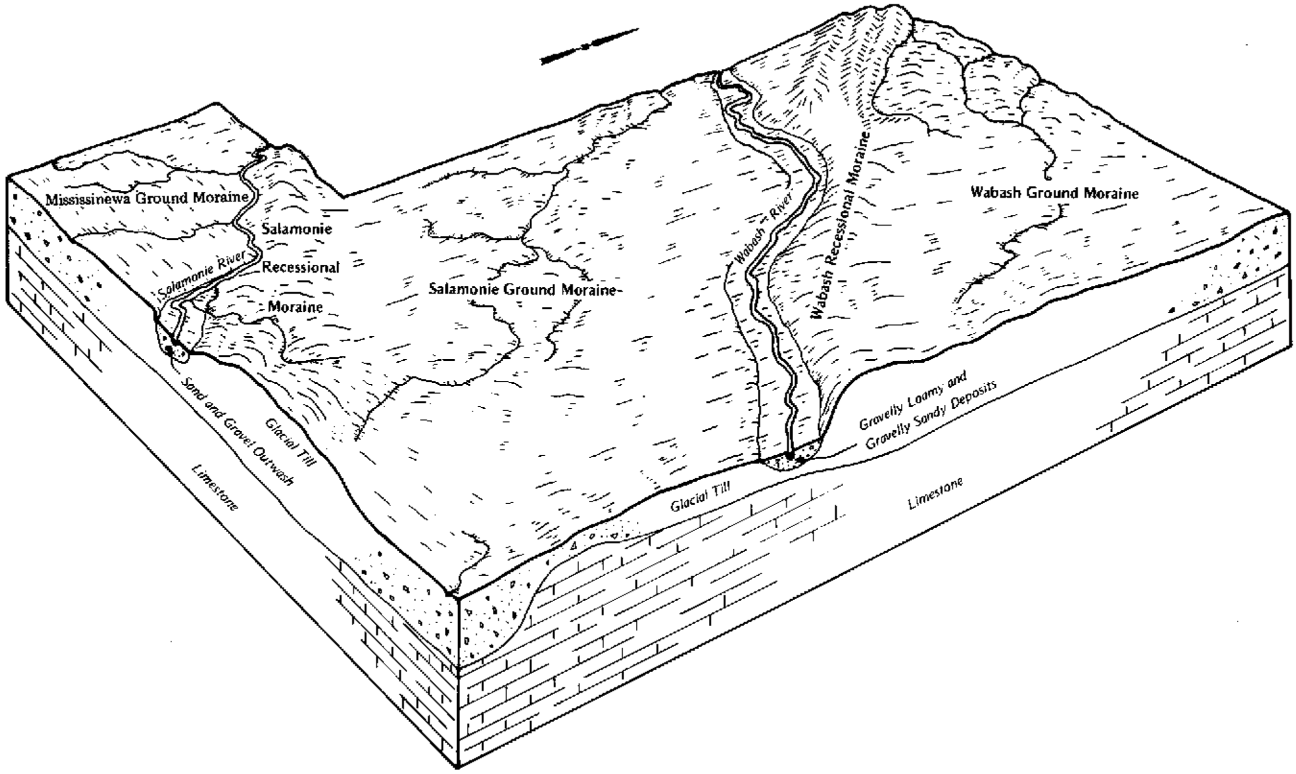

Figure 2.—Landforms in Wells County, Indiana.

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. Average windspeed is highest, 12 miles per hour, in spring.

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 (fig. 2), 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 interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

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

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

Map Unit Composition

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

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

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

General Soil Map Units

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

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

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Each association is rated for *cultivated crops, specialty crops, woodland,* and *urban uses.* Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

The names, descriptions, and delineations of the soils on the general soil map for this county do not necessarily agree with those for adjoining counties. This is because of changes in soil series concepts, differences in the extent of the dominant soils, or differences in the slope classes used. Also, the extent of a soil may be too small in some areas to be mapped separately but large enough in other areas.

1. Blount-Del Rey-Pewamo Association

Nearly level to gently sloping, deep, somewhat poorly drained and very poorly drained, medium textured and moderately fine textured soils formed in glacial till or in lacustrine sediments; on till plains and moraines

These soils are on uplands that are characterized by a very gradual swell-and-swale topography. Surface drainage is moderately well defined, but ponding is common in closed depressions.

This association makes up about 25 percent of the county. It is about 31 percent Blount soils, 26 percent Del Rey soils, 25 percent Pewamo soils, and 18 percent minor soils.

Blount soils are nearly level to gently sloping and are somewhat poorly drained. They are on slightly convex rises and are mapped in a complex with the Del Rey soils. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 14 inches thick. The upper part is brown and yellowish brown, mottled, firm clay. The lower part is yellowish brown, mottled, firm clay loam. The substratum is yellowish brown, mottled clay loam.

Del Rey soils are nearly level and somewhat poorly drained. They are on broad flats and slight rises. Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is mottled, firm silty clay loam about 28 inches thick. The upper part is brown, and the lower part is yellowish brown. The substratum is yellowish brown clay loam that has thin strata of sandy loam.

Pewamo soils are nearly level and very poorly drained. They are on broad flats, in depressions, and in shallow drainageways. Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 45 inches thick. The upper part is dark gray and gray, mottled, firm silty clay. The lower part is gray and grayish brown, mottled, firm silty clay loam. The substratum is gray, mottled silty clay loam.

Minor in this association are the well drained Eldean and Morley soils, the moderately well drained Glynwood, Rawson Variant, and Tuscola soils, the somewhat poorly drained Haskins Variant and Whitaker soils, and the very poorly drained Coesse and Rensselaer soils. Eldean, Morley, Rawson Variant, and Glynwood soils are on side slopes and narrow breaks along narrow drainageways. Haskins Variant soils are on the higher till plains and moraines. Whitaker soils are on terraces. Coesse soils are in depressions on till plains and moraines. Rensselaer soils are in depressions on terraces.

This association is used mainly for cultivated crops.

Most of the acreage has been drained. A few undrained areas are used as woodland or pasture. The wetness is the main limitation. The ponding is the main hazard.

If adequate drainage systems are installed, this association is well suited to most agricultural uses. The wetness is such a severe limitation that the suitability for residential development and other urban uses is poor. Overcoming this limitation is difficult. The suitability for woodland is good.

2. Pewamo-Del Rey-Blount Association

Nearly level, deep, very poorly drained and somewhat poorly drained, moderately fine textured and medium textured soils formed in lacustrine sediments or in glacial till; on till plains and moraines

These soils are on uplands that are characterized by a very gradual swell-and-swale topography. Surface drainage is poorly defined, and ponding is common in the depressions.

This association makes up about 31 percent of the county. It is about 70 percent Pewamo soils, 14 percent Del Rey soils, 8 percent Blount soils, and 8 percent minor soils.

Pewamo soils are very poorly drained. They are on broad flats, in depressions, and in shallow drainageways. Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 45 inches thick. The upper part is dark gray and gray, mottled, firm silty clay. The lower part is gray and grayish brown, mottled, firm silty clay loam. The substratum is gray, mottled silty clay loam.

Del Rey soils are somewhat poorly drained. They are on slight rises and are mapped in a complex with the Blount soils. Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is mottled, firm silty clay loam about 28 inches thick. The upper part is brown, and the lower part is yellowish brown. The substratum is yellowish brown clay loam that has thin strata of sandy loam.

Blount soils are somewhat poorly drained. They are on slightly convex rises. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 14 inches thick. The upper part is brown and yellowish brown, mottled, firm clay. The lower part is yellowish brown, mottled, very firm clay loam. The substratum is yellowish brown, mottled clay loam.

Minor in this association are the well drained Milton Variant and Morley soils, the moderately well drained Glynwood and Tuscola soils, the somewhat poorly drained Haskins Variant and Whitaker soils, and the very poorly drained Coesse and Millsdale soils. Glynwood and Morley soils are on the higher summits on till plains and moraines. Milton Variant soils are on the lower bedrock terraces. Tuscola soils are on slightly undulating ridgetops on terraces. Haskins Variant soils are on slight rises on till plains. Whitaker soils are on slight rises, commonly near small streams. Coesse soils are in deep depressions on till plains. Millsdale soils are in depressions on terraces.

This association is used mainly for cultivated crops, hay, or pasture. If drained, it is well suited to these uses. The wetness is such a severe limitation that the suitability for residential development and other urban uses is poor. Overcoming this limitation is difficult. The suitability for woodland is good.

3. Milford-Del Rey-Blount Association

Nearly level to gently sloping, deep, very poorly drained to somewhat poorly drained, moderately fine textured and medium textured soils formed in lacustrine sediments or in glacial till; on till plains and moraines

These soils are on slightly dissected uplands that are characterized by numerous small streams and rivers. Areas of these soils are small but are throughout the county.

This association makes up about 6 percent of the county. It is about 56 percent Milford soils, 25 percent Del Rey soils, 8 percent Blount soils, and 11 percent minor soils (fig. 3).

Milford soils are nearly level and are poorly drained or very poorly drained. They are on broad flats and in depressions. Typically, the surface layer is very dark grayish brown silty clay loam about 15 inches thick. The subsoil is about 42 inches thick. The upper part is dark gray, mottled, firm clay loam and silty clay loam. The lower part is grayish brown, mottled, firm silty clay, silty clay loam, and clay loam. The substratum is grayish brown, mottled clay loam that has thin strata of sandy loam.

Del Rey soils are nearly level and somewhat poorly drained. They are on slight rises and along shallow depressions and are mapped in a complex with the Blount soils. Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 28 inches thick. It is brown and yellowish brown, mottled, firm silty clay loam. The substratum is yellowish brown clay loam that has thin strata of sandy loam.

Blount soils are nearly level to gently sloping and are somewhat poorly drained. They are on slightly convex rises. Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part is dark yellowish brown, mottled, friable silt loam. The lower part is yellowish brown and dark yellowish brown, mottled, firm clay loam. The substratum is yellowish brown clay loam.

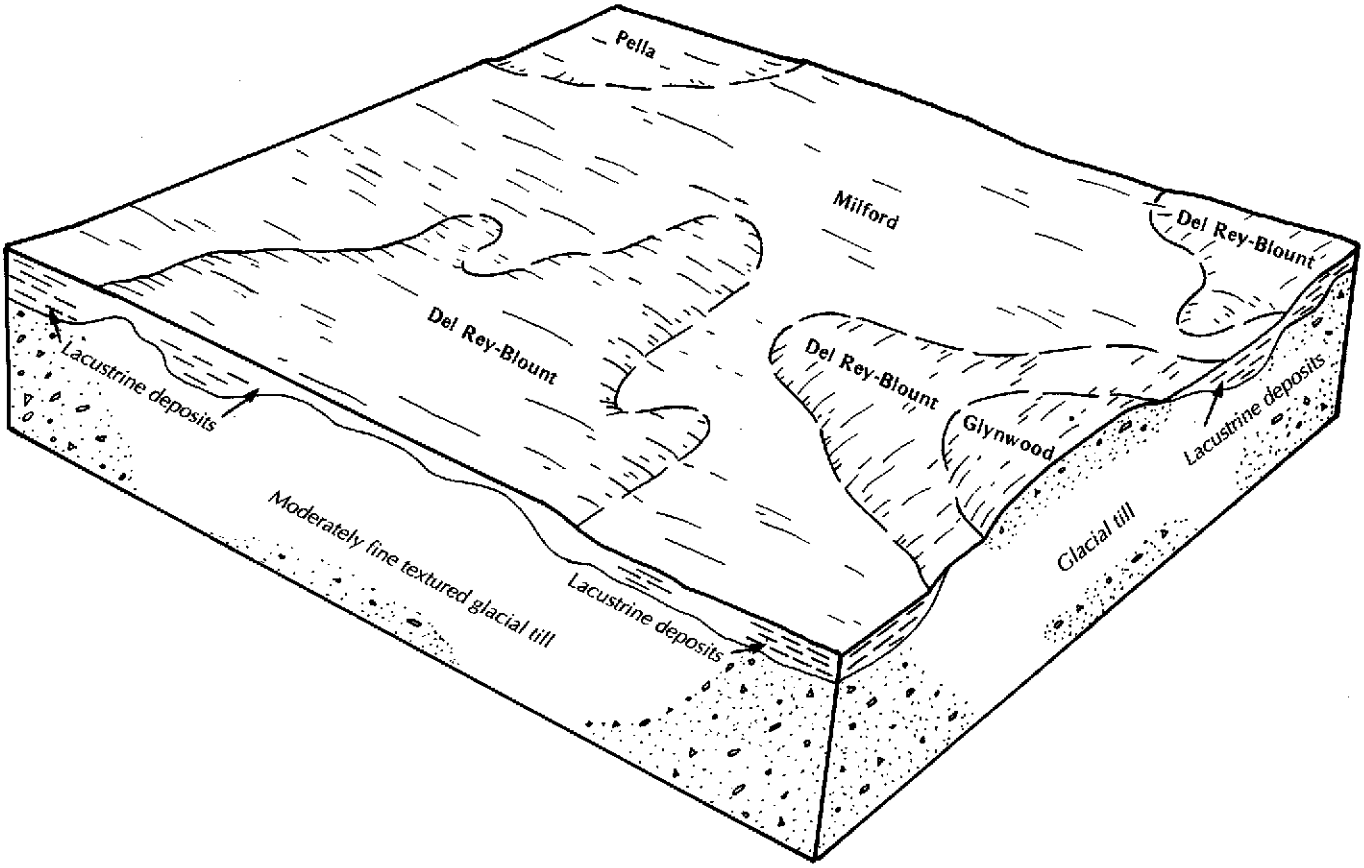

Figure 3.—Pattern of soils and parent material in the Milford-Del Rey-Blount association.

Minor in this association are the moderately well drained Glynwood soils, the poorly drained Pella soils, and the very poorly drained Pewamo soils. Glynwood soils are on the higher summits on uplands. Pella soils are in broad depressions. Pewamo soils are on broad flats and in shallow drainageways.

This association is used mainly for cultivated crops, pasture, or hay. Some areas are used as woodland. Most wooded areas are swampy and undrained. The wetness and the ponding are the main limitations.

If drained, this association is well suited to agricultural uses. The wetness is such a severe limitation that the suitability for residential development and other urban uses is poor. The suitability for woodland is good.

4. Sloan-Shoals-Rensselaer Association

Nearly level, deep, very poorly drained and somewhat poorly drained, moderately fine textured and medium textured soils formed in alluvium and outwash; on flood plains and stream terraces

These soils are on bottom land and low benches characterized by nearly level or slightly undulating areas dissected by overflow channels and drainageways. Ponding is common away from the stream channels.

This association makes up about 5 percent of the county. It is about 28 percent Sloan and similar soils, 25 percent Shoals and similar soils, 22 percent Rensselaer and similar soils, and 25 percent minor soils.

Sloan soils are very poorly drained. They are in depressions away from the stream channels. Typically, the surface layer is very dark grayish brown silty clay loam about 11 inches thick. The subsoil is mottled clay loam about 25 inches thick. The upper part is dark grayish brown and friable, and the lower part is dark gray and firm. The substratum is dark gray, grayish brown, and dark grayish brown clay loam that has strata of loam, silt loam, sandy loam, and gravelly sandy loam.

Shoals soils are somewhat poorly drained. They are on broad flats adjacent to the larger streams and in shallow drainageways. Typically, the surface layer is dark grayish brown loam about 10 inches thick. The subsurface layer is brown loam about 7 inches thick. The substratum is dark grayish brown, yellowish brown, and brown, mottled, firm loam.

Rensselaer soils are very poorly drained. They are on slight rises and benches along the major stream channels. Typically, the surface layer is very dark grayish brown loam about 10 inches thick. The subsurface layer also is very dark grayish brown loam. It is about 6 inches thick. The subsoil is about 27 inches thick. The upper part is dark grayish brown, mottled, friable silty clay loam. The next part is dark grayish brown, mottled, firm clay loam. The lower part is grayish brown, mottled, firm clay loam. The substratum is yellowish brown, mottled loam that has thin strata of sandy loam and loamy sand.

Minor in this association are the well drained Armiesburg and Milton Variant soils, the moderately well drained Haney, Rawson Variant, and Tuscola soils, and the somewhat poorly drained Randolph soils. Armiesburg soils are on the higher flood plains. Milton Variant soils are on the lower summits on bedrock terraces. Rawson Variant soils are on the higher summits on till plains and moraines. Haney and Tuscola soils are on terraces. Randolph soils are on bedrock terraces.

Most of this association is used for cultivated crops or woodland. A few areas are used as pasture. Some gravel pits and limestone quarries are in areas of this association. A few areas are used for urban development. The flooding is the main hazard. The wetness is the main limitation.

If protected from flooding, the soils on bottom land are well suited to cultivated crops. The soils on terraces are well suited to cultivated crops. Some areas are not adequately drained.

Because of the wetness and the hazard of flooding, the suitability of this association for residential development and other urban uses is poor. Overcoming these limitations is very difficult. The suitability for woodland is fair.

5. Sloan-Eldean-Ross Association

Nearly level to moderately sloping, very poorly drained and well drained, moderately fine textured and medium textured soils that are deep or moderately deep over sand and gravel; formed in alluvium on flood plains and in outwash on stream terraces

These soils are on bottom land and stream terraces characterized by nearly level or rolling areas dissected by overflow channels and drainageways (fig. 4).

This association makes up about 2 percent of the county. It is about 29 percent Sloan and similar soils, 23 percent Eldean and similar soils, 18 percent Ross and similar soils, and 30 percent minor soils.

Sloan soils are nearly level and very poorly drained. They are in depressions away from the main stream channels. Typically, the surface layer is very dark grayish brown silty clay loam about 11 inches thick. The subsoil is mottled clay loam about 25 inches thick. The upper part is dark grayish brown and friable. The lower part is dark gray and firm. The substratum is dark gray, grayish brown, and dark grayish brown clay loam that has strata of loam, silt loam, sandy loam, and gravelly sandy loam.

Eldean soils are nearly level to moderately sloping and are well drained. They are on the higher summits. Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 30 inches thick. The upper part is dark brown and brown, firm clay loam, clay, and gravelly clay. The next part is brown, firm sandy clay loam. The lower part is dark brown, firm very gravelly sandy clay loam. The substratum is yellowish brown, stratified coarse sand and extremely gravelly coarse sand.

Ross soils are nearly level and well drained. They are on natural leeves along stream channels and on broad islands in braided channels. Typically, the surface layer is very dark grayish brown loam about 17 inches thick. The subsoil is dark brown and dark yellowish brown, friable loam about 33 inches thick. The substratum is dark yellowish brown sandy loam.

Minor in this association are the somewhat poorly drained Blount, Haskins Variant, Shoals, and Whitaker soils, the moderately well drained Glynwood and Tuscola soils, and the well drained Morley soils. Blount and Haskins Variant soils are on slight rises on till plains and moraines. Shoals soils are on broad, nearly level flood plains. Whitaker soils are on terraces. Morley soils are on the higher summits on till plains and moraines. Glynwood soils are on the lower summits on till plains and moraines. Tuscola soils are on slight rises on terraces.

Nearly all of this association is used for cultivated crops. A few undrained areas are used as woodland or pasture. Grain cash crops and hog, beef, dairy cattle, and sheep operations are the main farm enterprises. Flooding is the main hazard affecting urban development and farming. Erosion also is a hazard.

If drained and protected from flooding, the Sloan soils are fairly well suited to cultivated crops. The flooding is a severe limitation affecting urban development. The nearly level Eldean soils are well suited to cultivated crops. They also are suited to dwellings, but a poor filtering capacity is a severe limitation for septic tank absorption fields. If protected from flooding, the Ross soils are well suited to cultivated crops. The flooding is a severe limitation affecting urban development.

The sloping areas in this association are well suited to poorly suited to cultivated crops and to grasses and legumes. The hazard of erosion is the main

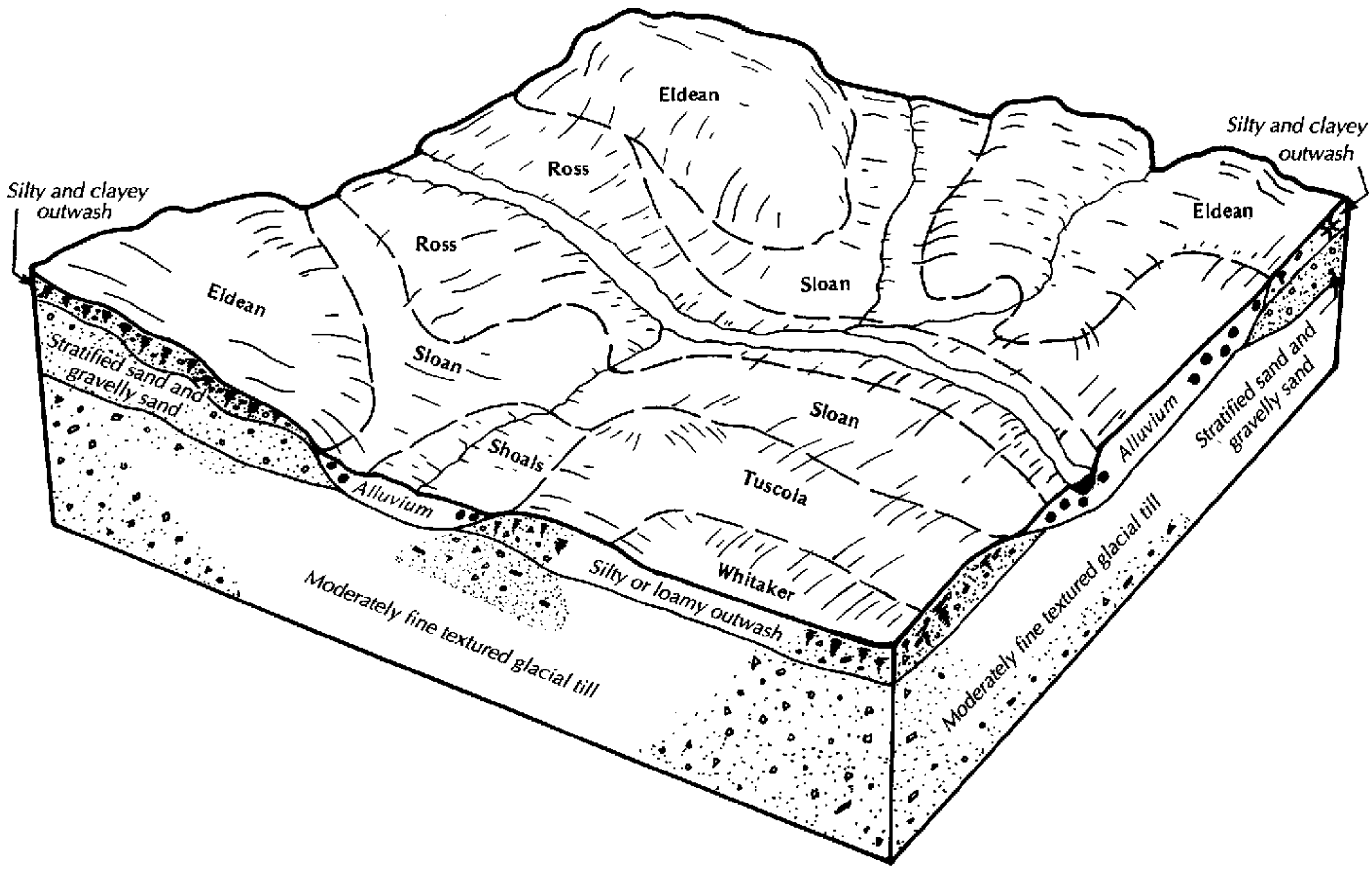

Figure 4.—Pattern of soils and parent material in the Sloan-Eldean-Ross association.

management concern. The suitability for woodland is fair or good.

6. Blount-Del Rey-Glynwood Association

Gently sloping, deep, somewhat poorly drained and moderately well drained, medium textured soils formed in glacial till and lacustrine sediments; on till plains and moraines

These soils are on slightly dissected uplands that are characterized by numerous small streams and rivers. Areas of these soils are large and are throughout the county.

This association makes up about 31 percent of the county. It is about 39 percent Blount and similar soils, 30 percent Del Rey and similar soils, 21 percent Glynwood and similar soils, and 10 percent minor soils (fig. 5).

Blount soils are somewhat poorly drained. They are along drainageways and on swells and are mapped in a complex with the Del Rey soils. Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part is dark yellowish brown, mottled, friable silt loam. The lower part is yellowish brown and dark yellowish brown, mottled, firm clay loam. The substratum is yellowish brown, mottled clay loam.

Del Rey soils are somewhat poorly drained. They are on swells. Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 30 inches thick. It is yellowish brown, mottled, firm silty clay loam and clay loam. The substratum is yellowish brown clay loam that has thin strata of sandy loam.

Glynwood soils are moderately well drained. They are on narrow ridgetops and knolls on uplands. Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 15 inches thick. The upper part is yellowish brown, firm silty clay loam. The lower part is yellowish brown, mottled, firm clay loam and silty clay loam. The substratum is yellowish brown silty clay loam.

Minor in this association are the well drained Armiesburg, Eldean, and Morley soils, the somewhat poorly drained Randolph soils, and the very poorly

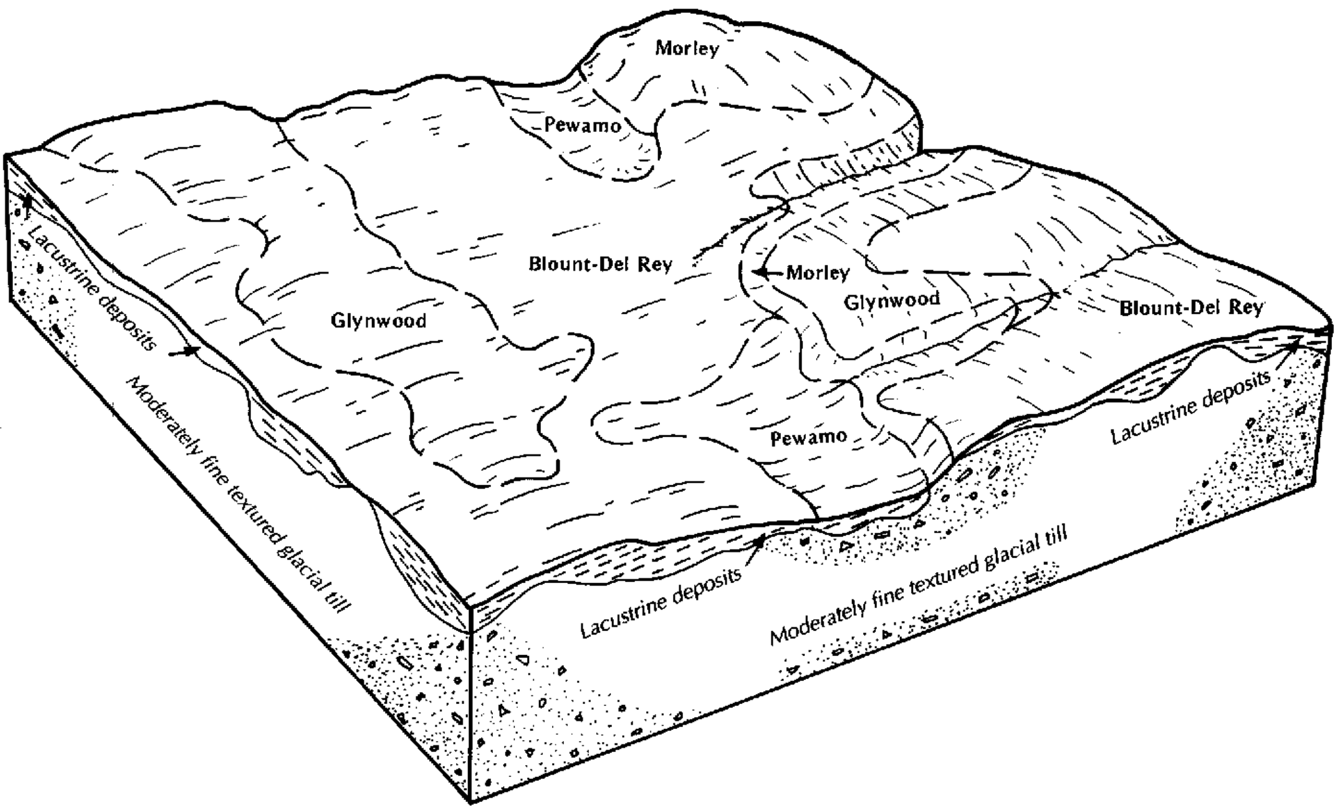

Figure 5.—Pattern of soils and parent material in the Blount-Del Rey-Glynwood association.

drained Millgrove, Millsdale, Pewamo, Rensselaer, and Wallkill soils. Armiesburg soils are on slight rises on flood plains. Eldean soils are on the higher summits on terraces. Morley soils are on the summits and side slopes of till plains and moraines. Randolph soils are on slight rises and broad flats on terraces. Millgrove and Rensselaer soils are in depressions on terraces. Millsdale soils are on broad, flat bedrock terraces. Pewamo soils are on broad flats, in depressions, and in drainageways on till plains and moraines. Wallkill soils are on broad flats and in deep depressions on flood plains.

This association is used mainly for cultivated crops, pasture, or hay. Some areas are used as woodland. Most wooded areas are swampy and undrained. Erosion is the main hazard affecting farming. Wetness is the main limitation affecting farming and most other uses.

If drained, this association is well suited to most agricultural uses. Wetness is such a severe limitation that the suitability for residential development and other urban uses is fair or poor. The suitability for woodland is good.

Broad Land Use Considerations

The soils in general soil map units 1, 2, 3, and 4 are well suited to farming. If drained, they are very well suited to corn and soybeans. The soils in units 5 and 6 are fairly well suited to farming. A drainage system is needed for maximum production on most of the soils used for farming. The cost of the system usually is justified by the increased yields. Most of the soils used for farming are drained and are intensively managed.

The Eldean soils in unit 5 are well suited to vegetables and other specialty crops. If the soils in the survey area that have organic layers are drained, they also are well suited to these crops. The well drained soils in the survey area are well suited to nursery and orchard crops.

Most of the soils in the survey area are fairly well suited or well suited to trees, and a few are managed for commercial wood production. Trees that have commercial value are most common in areas of soils that have good natural drainage, because the trees grow more rapidly on these soils than on the wet ones.

The Eldean and Glynwood soils in units 5 and 6 are fairly well suited to use as parks and natural study areas. Hardwood forests enhance the beauty of these areas. Some undrained areas of these units provide habitat for many types of wildlife.

About 2 percent of the survey area presently is used for urban development. A narrow band of cropland around the towns of Bluffton, Markle, Ossian, and Zanesville is being converted to urban uses. The information in this section can be helpful in the general planning of urban areas, but it cannot be used to select specific sites for urban structures.

Many of the soils in the survey area are poorly suited to urban development. The Rensselaer, Ross, Shoals, and Sloan soils in units 4 and 5 are severely limited as sites for urban development because of the flooding. The Eldean soils in unit 5 are well suited to urban development. Extensive drainage is required for urban development on all of the soils in the survey area, except those in unit 5. Unit 5 has a higher percentage of soils suited to urban development than any of the other units.

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 substratum, 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 substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Morley clay loam, 6 to 12 percent slopes, severely eroded, is a phase of the Morley 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. Blount-Del Rey silt loams, 1 to 4 percent slopes, eroded, is an example.

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

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

The names, descriptions, and delineations of the soils on the detailed soil map for this county do not necessarily agree with those of adjoining counties. This is because of changes in soil series concepts, differences in the extent of the dominant soils, or differences in the slope classes used. Also, the extent of a soil may be too small in some areas to be mapped separately but large enough in other areas.

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

An—Armiesburg silty clay loam, frequently flooded. This deep, nearly level, well drained soil is on flood plains. It is frequently flooded for brief periods by overflow from streams. Most areas are elongated and are 3 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 12 inches thick. The subsurface layer is about 8 inches of very dark grayish brown clay loam. The subsoil is dark brown and dark yellowish brown, firm clay loam about 30 inches thick. The substratum to a depth of 60 inches is brown silty clay loam. In some places the soil is loam or sandy loam to a depth of 40 inches. In other places the surface layer is not so dark. In some areas the soil is only occasionally flooded. In other areas recent alluvium overlies the original black surface layer. In a few places the subsoil contains more clay and silt.

Included with this soil in mapping are areas of the very poorly drained Saranac soils. These soils are in the lower landscape positions. Also included are areas that are not frequently flooded. Included soils make up about 8 percent of the map unit.

Permeability is moderate in the Armiesburg soil. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked. The clods are hard when dry and make seedbed preparation difficult.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is well suited to corn and soybeans. The flooding is the major hazard. It can result in some crop damage during the cropping season. Levees can be constructed to prevent flooding. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain the organic matter content and improve tilth. The soil is well suited to no-till farming.

This soil is well suited to grasses and most legumes, such as bromegrass and ladino clover, for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, however, because of the flooding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by spraying, cutting, or girdling unwanted trees and shrubs.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads because of low strength, the flooding, and frost action. Constructing the roads on raised, well compacted fill material and installing culverts improve the ability of the roads to support vehicular traffic and minimize the damage caused by low strength, flooding, and frost action.

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

BdA—Belmore Variant loam, 0 to 2 percent slopes, frequently flooded. This deep, nearly level, well drained soil is on low stream terraces. It is frequently flooded for brief periods by overflow from streams. Areas are irregular in shape and are 3 to 50 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsurface layer is about 4 inches of dark brown loam. The subsoil is about 52 inches thick. The upper part is dark brown and brown, firm loam. The next part is brown, firm sandy clay loam. The lower part is brown and dark yellowish brown, friable sandy loam and fine sandy loam. The substratum to a depth of 72 inches is yellowish brown, calcareous very gravelly sandy loam that has thin strata of loamy coarse sand. In some areas the surface layer is lighter colored and thinner. In other areas the solum has less sand and more silt. In some places the profile is darker colored to a depth of more than 24 inches. In other places the slope is more than 3 percent. In many areas the solum contains clay. In some areas the lower part of the solum and the substratum have more sand and less gravel or clay. In some small areas the substratum is at a depth of less than 50 or more than 65 inches. In a few areas the upper part of the substratum is stratified gravelly sand or is loamy and clayey.

Included with this soil in mapping are small areas of the well drained Eldean Variant soils on the higher summits. Eldean Variant soils have more clay than the Belmore Variant soil. Also included are some small areas of the moderately well drained Haney soils on slight rises, the somewhat poorly drained Digby soils on broad flats, and the very poorly drained Millgrove soils in wet depressions. Included soils make up about 15 percent of the map unit.

Permeability is moderately rapid in the subsoil of the Belmore Variant soil and rapid in the substratum. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some small areas are used for hay, pasture, or specialty crops or for woodland.

This soil is well suited to corn, soybeans, and small grain. Flooding is the major hazard. It can result in some crop damage during the cropping season. Levees can be constructed to prevent flooding. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. This soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass or orchardgrass, and legumes, such as alfalfa, for hay and pasture. Flooding may cause seasonal damage to the stand. Overgrazing reduces the plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. It can be controlled by proper site preparation and by cutting, spraying, and girdling unwanted trees and shrubs.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads because of the flooding. Constructing the roads on raised, well compacted fill material and installing culverts improve the ability of the roads to support vehicular traffic and minimize the damage caused by flooding.

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

BkB2—Blount-Del Rey silt loams, 1 to 4 percent slopes, eroded. These deep, nearly level and gently sloping, somewhat poorly drained soils are along drainageways and on swells on till plains and moraines. The Blount soil is on the high rises and in the more sloping areas along drainageways. The Del Rey soil is in the broader, less sloping areas. Most areas generally are irregularly shaped or elongated and are 3 to 200 acres in size. They are about 55 percent Blount soil and 30 percent Del Rey soil. These soils occur as areas so intricately mixed or so small that separating them in mapping was not practical.

Typically, the surface layer of the Blount soil is dark brown silt loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part is dark yellowish brown, mottled, friable silt loam, and the lower part is yellowish brown and dark yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled clay loam. In some areas, the silty material is more than 12 inches thick and the upper part of the subsoil has less sand. In other areas, the slope is more than 4 percent and the soil is eroded. In places the limestone bedrock is within a depth of 60 inches. In some small areas the solum is more than 40 inches thick. In a few areas the subsoil has less clay. In a few places the surface layer is dark. In other places the surface layer is silty clay loam or clay loam.

Typically, the surface layer of the Del Rey soil is brown silt loam about 8 inches thick. The subsoil is about 30 inches of yellowish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of 60 inches is yellowish brown, very firm clay loam that has thin strata of sandy loam. In some small areas the solum is more than 40 inches thick. In places the slope is more than 4 percent. In a few areas the subsoil has less clay. In some areas the surface layer and subsoil have more sand. In other areas the substratum is very fine sand and loamy sand. In a few places the soil has a substratum of glacial till or is underlain by limestone. In some areas the surface layer is silty clay loam or clay loam.

Included with these soils in mapping are small areas of the well drained Morley and moderately well drained Glynwood soils on the slightly higher knobs and rises and small areas of the very poorly drained Pewamo soils in depressions and drainageways. Included soils make up about 8 percent of the map unit.

Permeability is slow in the Blount and Del Rey soils. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is medium. The water table is at a depth of 1 to 3 feet in winter and spring. The surface layer crusts after periods of rainfall.

Most areas are used for cultivated crops. Some are used for hay or pasture, and a few are used for orchards, woodland, or specialty crops. Some areas in the central and northern parts of the county are used for urban development.

These soils are well suited to corn, soybeans, small grain, and tomatoes. Erosion is the main hazard. Measures that control erosion and runoff are needed if cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. Most areas have been drained by subsurface drains, surface drains, or both. The soils are well suited to ridge-till farming.

These soils are well suited to grasses and legumes. They are less well suited to deep-rooted legumes, such as alfalfa, than to shallow-rooted legumes because of the wetness. Erosion is the main hazard. A cover of hay and pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are fairly well suited to trees, but only a few areas are wooded. Seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Seedlings survive and grow well if competing vegetation is controlled by special site preparation and by cutting, spraying, or girdling unwanted trees and shrubs. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the wetness, these soils are severely limited as sites for dwellings. An adequate drainage system is needed to lower the water table. Water moves slowly to drainage systems because of the slow permeability. Dwellings should be constructed without basements.

Because of frost action and low strength, these soils are severely limited as sites for local roads and streets. Roadside ditches help to remove excess water and minimize the damage caused by frost action. Strengthening the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the slow permeability, these soils are severely limited as sites for septic tank absorption fields. Where sanitary sewers are not available, an enlarged septic tank absorption field should be installed to increase the area of absorption. Filling or mounding the absorption field with suitable material improves the capacity of the field to absorb the effluent. Installing an adequate perimeter subsurface drainage system lowers the water table.

The land capability classification is IIe. The woodland ordination symbol assigned to the Blount soil is 3C, and that assigned to the Del Rey soil is 4C.

Co—Coesse silt loam. This deep, nearly level, very poorly drained soil is in depressions on till plains. It is frequently ponded by runoff from the higher adjacent slopes. Areas are irregular in shape and are 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The upper substratum is dark grayish brown, firm silt loam about 15 inches thick. It is underlain by a buried surface layer of very dark gray silty clay about 10 inches thick. Below this layer is a subsoil, which is about 25 inches of dark gray and gray, mottled, firm silty clay, clay, and clay loam. The lower substratum to a depth of 65 inches is gray, mottled silty clay loam. In some places the overwash is less than 20 inches thick. In other places the buried soil has more sand and less clay. In some areas the alluvium contains more clay and is more than 40 inches thick. In a few places the slope is more than 2 percent.

Included with this soil in mapping are the well drained Morley soils in the higher positions on the landscape and the very poorly drained Milford and Pewamo soils on broad flats. Milford and Pewamo soils are grayer than the Coesse soil. Also, they are higher on the landscape. Included soils make up about 5 percent of the map unit.

Permeability is moderately slow in the Coesse soil. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is very slow or ponded. The water table is at or above the surface from late in fall to spring. The surface soil is friable, and tilth is good.

Most areas are used for cultivated crops. A few are used for hay or pasture or for woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Excess water can be removed by subsurface drains, surface drains, or pumps or by a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and improves tilth. The soil is well suited to ridge-till farming.

If drained, this soil is well suited to grasses, such as reed canarygrass, and shallow-rooted legumes, such as ladino clover, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, because of the wetness. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of low strength, the ponding, and frost action, it is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, establishing adequate roadside ditches, and installing culverts help to overcome these limitations.

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

DeA—Del Rey-Blount silt loams, 0 to 1 percent slopes. These deep, nearly level, somewhat poorly drained soils are on slight rises on till plains and moraines. The Del Rey soil is in the broader, less sloping areas, and the Blount soil is on the higher rises and in the more sloping areas along drainageways. Most areas are irregular in shape, but some are elongated. They are 3 to 350 acres in size. They are about 55 percent Del Rey soil and 35 percent Blount soil. These soils occur as areas so intricately mixed or so small that separating them in mapping was not practical.

Typically, the surface layer of the Del Rey soil is brown silt loam about 9 inches thick. The subsoil is about 28 inches of brown and yellowish brown, mottled, firm silty clay loam. The substratum extends to a depth of 60 inches. The upper part is yellowish brown, mottled silty clay loam, and the lower part is yellowish brown, stratified silty clay loam and silt loam. In some small areas the solum is more than 40 inches thick. In other areas the slope is more than 1 percent. In a few areas the subsoil has less clay. In some areas the surface layer and subsoil have more sand. In other areas the soil has a substratum of very fine sand and loamy sand or is underlain by limestone.

Typically, the surface layer of the Blount soil is dark grayish brown silt loam about 9 inches thick. The subsoil is about 14 inches thick. The upper part is brown and yellowish brown, mottled, firm clay, and the lower part is yellowish brown, mottled, very firm clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled clay loam. In some areas, the silty material is more than 9 inches thick and the upper part of the subsoil has less clay. In other areas, the slope is more than 1 percent and the soil is eroded. In some small areas the solum is more than 40 inches thick. In a few areas the subsoil has more sand. In a few other areas the surface layer is dark. In some areas the solum is stratified above the glacial till. In a few places limestone is at a depth of about 50 inches.

Included with these soils in mapping are small areas of the poorly drained Pella and very poorly drained Milford and Pewamo soils in depressions. Also included are small areas of soils on the steeper slopes adjacent to streams. Included soils make up about 10 percent of the map unit.

Permeability is slow in the Del Rey and Blount soils. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 1 to 3 feet in winter and spring. The surface layer may crust after periods of rainfall.

Most areas are used for cultivated crops. Some are used for hay or pasture, and a few are used for orchards, woodland, and specialty crops. Some areas in the central and northern parts of the county are used for urban development.

If drained, these soils are well suited to corn, soybeans, small grain, and tomatoes. Wetness is the main limitation. Most areas have been drained by subsurface drains, surface drains, or both. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content. These soils are well suited to ridge-till farming.

These soils are well suited to grasses and legumes. Wetness is the main limitation. Unless the soils are adequately drained, they are less well suited to deep-rooted legumes, such as alfalfa, than to shallow-rooted species. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are fairly well suited to trees, but only a few areas are wooded. Seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Seedlings survive and grow well if competing vegetation is controlled by special site preparation and by cutting, spraying, or girdling unwanted trees and shrubs. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the wetness, these soils are severely limited as sites for dwellings. A foundation drainage system lowers the water table. Water moves slowly to drainage systems because of the slow permeability. Dwellings should be constructed without basements.

Because of frost action and low strength, these soils are severely limited as sites for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by frost action and low strength and improve the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the slow permeability, these soils are severely limited as sites for septic tank absorption fields. Sanitary sewers should be used if they are available. If septic tank absorption fields are used, enlarging the fields helps to compensate for the restricted permeability. Installing an adequate perimeter subsurface drainage system helps to lower the water table.

The land capability classification is IIw. The woodland ordination symbol assigned to the Del Rey soil is 4C, and that assigned to the Blount soil is 3C.

DkA—Digby silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad stream terraces. Areas are elongated or irregularly shaped and are 3 to 25 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 48 inches thick. The upper part is dark yellowish brown, mottled, firm silty clay loam, the next part is yellowish brown, mottled, firm clay loam, and the lower part is yellowish brown, mottled, firm gravelly loam. The substratum to a depth of 60 inches is yellowish brown, calcareous very gravelly coarse sandy loam that has thin strata of loamy sand. In a few places the subsoil has more sand and gravel. In some areas the substratum is calcareous glacial till or stratified silt and sand.

Included with this soil in mapping are areas of the well drained Belmore Variant and Eldean Variant and moderately well drained Haney soils on low knolls, on ridges, and along minor drainageways. Also included are small, undrained areas of the very poorly drained Millgrove soils on the lower parts of the landscape and some areas of severely eroded soils. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Digby soil and rapid in the substratum. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 1.0 to 2.5 feet in winter and early in spring. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay or pasture, and a few are used for orchards or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is a limitation. Most areas have been drained by subsurface drains, surface drains, or both. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and improve tilth. This soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. The wetness is a limitation. Subsurface drains are effective in removing excess water. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the wetness, this soil is severely limited as a site for dwellings. The instability of cutbanks is a severe limitation in shallow excavations. Trench walls should be reinforced. Subsurface drains help to lower the water table. Dwellings should be constructed without basements.

Because of frost action, this soil is severely limited as a site for local roads and streets. Replacing or covering the upper soil layers with suitable base material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material, providing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action.

Because of the wetness and a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. Installing an adequate curtain drainage system around the absorption field lowers the water table. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water supplies. Filling or mounding the absorption field with suitable material improves the capacity of the field to filter the effluent.

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

Ee—Eel silt loam, frequently flooded. This deep, nearly level, moderately well drained soil is on flood plains near major streams. It is frequently flooded for brief periods by stream overflow. Areas are elongated and are 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches of dark brown and brown, friable silt loam and loam. The substratum extends to a depth of 60 inches. The upper part is grayish brown, mottled loam. The next part is dark grayish brown and light brownish gray, mottled sandy loam. The lower part is grayish brown sandy loam. In some areas the surface layer is darker colored. In other areas the soil has more clay. In some places gravelly coarse sand and coarse sand are within a depth of 50 inches.

Included with this soil in mapping are small areas of the well drained Ross soils on the highest parts of the landscape and the somewhat poorly drained Shoals and very poorly drained Sloan soils in slight depressions. Also included are soils that are not frequently flooded. Included soils make up about 15 percent of the map unit.

Permeability of the Eel soil is moderate. The available water capacity is high. The organic matter content is moderately low in the surface layer. Runoff is slow. The water table is at a depth of 1.5 to 3.0 feet in winter and early in spring. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for pasture, woodland, or specialty crops.

This soil is well suited to corn and soybeans. It is poorly suited to small grain, because the flooding in spring usually damages the crop. The flooding, however, generally occurs before the spring crops are planted. It can be controlled in some areas by installing levees and surface drains. A conservation tillage system that leaves protective amounts of crop residue on the surface and winter cover crops improve tilth and maintain the organic matter content. This soil is well suited to no-till farming and spring chiseling.

This soil is well suited to grasses and legumes for hay or pasture. The flooding is a hazard. The wetness is the main limitation. The flooding may damage the crops in winter and early in spring. A complete drainage system is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of frost action and the flooding, the soil is severely limited as a site for local roads. Constructing roads on raised, well compacted fill material, providing adequate roadside ditches, and installing culverts help to prevent the damage caused by the flooding and frost action. Strengthening or replacing the base with better suited material improves the ability of the roads to support vehicular traffic. Levees help to control the flooding.

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

EoA—Eldean loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces. It is moderately deep over sand and gravel. Areas are elongated or irregular in shape and are 4 to 80 acres in size.

Typically, the surface layer is dark brown loam about 10 inches thick. The subsoil is about 35 inches thick. The upper part is brown, firm loam. The next part is brown, firm gravelly clay. The lower part is reddish brown, firm gravelly clay loam and gravelly clay. The substratum to a depth of 60 inches is yellowish brown, loose, stratified sand and gravel. In some places the subsoil has more sand. In other places the subsoil and substratum do not contain gravel. In some areas the substratum is glacial till. In other areas the lower part of the subsoil has gray mottles. In some places stratified extremely gravelly coarse sandy loam is at a depth of more than 40 inches. In other places the slope is more than 2 percent. In a few places the surface layer is dark.

Included with this soil in mapping are the moderately well drained Glynwood Variant soils on the higher convex slopes and the well drained Morley soils on the higher summits. Morley soils are not so gravelly as the Eldean soil. Also included are areas of the well drained Ross and very poorly drained Sloan soils on flood plains. The Ross soils have less clay and gravel than the Eldean soil. Included soils make up about 12 percent of the map unit.

Permeability is moderate or moderately slow in the subsoil of the Eldean soil and rapid in the substratum. The available water capacity is moderate. The organic matter content is moderately low in the surface layer. Runoff is slow. The surface layer is friable. It is fairly easily tilled under the proper moisture conditions, but clods form if it is cultivated when wet.

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

This soil is well suited to corn, soybeans, and small grain. The moderate available water capacity is the main management concern. A system of conservation tillage that leaves protective amounts of crop residue on the surface conserves moisture, improves tilth, and maintains the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass, and legumes, such as alfalfa, for hay or pasture. The moderate available water capacity is the main management concern. Overgrazing during droughty periods and grazing when the soil is wet cause surface compaction and poor tilth. Overgrazing also reduces the plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet and dry periods reduces surface compaction and helps to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is suitable as a site for dwellings with basements. The instability of cutbanks is a concern in shallow excavations. Trench walls should be reinforced. Strengthening foundations and footings and backfilling with sand and gravel help to prevent the structural damage caused by shrinking and swelling.

Because of low strength, this soil is severely limited as a site for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by low strength.

Because of a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. The absorption fields should be installed away from sources of drinking water. Filling or mounding the absorption field with suitable material improves the capacity of the field to filter the effluent.

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

EoB2—Eldean loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is on stream terraces. It is moderately deep over sand and gravel. Areas are elongated or irregularly shaped and are 4 to 75 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 30 inches thick. The upper part is dark brown, firm clay loam. The next part is brown, firm clay and gravelly clay. The lower part is brown and dark brown, firm sandy clay loam and very gravelly sandy clay loam. The substratum to a depth of 60 inches is yellowish brown, loose, stratified coarse sand and extremely gravelly coarse sand. In some places the subsoil has less clay. In other places the subsoil and substratum do not contain gravel. In some areas the lower part of the subsoil has gray mottles. In other areas the substratum is glacial till. In some places stratified extremely gravelly coarse sandy loam is at a depth of more than 40 inches. In other places the soil is severely eroded and has a surface layer of clay loam or gravelly clay loam. In some areas the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are the moderately well drained Glynwood Variant soils on the slightly lower convex slopes and the well drained Morley soils on the summits of higher slopes. Morley soils have less gravel than the Eldean soil. Also included are areas of the well drained Ross and very poorly drained Sloan soils on flood plains. The Ross soils have less clay and gravel than the Eldean soil. Included soils make up about 10 percent of this map unit.

Permeability is moderate or moderately slow in the subsoil of the Eldean soil and rapid in the substratum. The available water capacity is moderate. The organic matter content is moderately low in the surface layer. Runoff is rapid. The surface layer is friable. It can be easily tilled throughout a fairly wide range in moisture conditions, but clods form if it is cultivated when wet.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard. It can be reduced by including grasses and legumes in the crop rotation, constructing grassed waterways or terraces, or using a combination of these practices. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface conserve moisture, help to control erosion, improve tilth, and maintain the organic matter content. The soil is droughty during extended dry periods. It is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass, and legumes, such as alfalfa, for hay and pasture. Erosion is the main management concern. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth and reduces the plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is suitable as a site for dwellings with basements. The instability of cutbanks is a concern in shallow excavations. Trench walls should be reinforced. Strengthening the foundations and footings and backfilling with sand and gravel help to prevent the structural damage caused by shrinking and swelling.

Because of low strength, this soil is severely limited as a site for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by low strength.

Because of a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. The absorption fields should be installed away from sources of drinking water. Filling or mounding the absorption field with suitable material improves the capacity of the field to filter the effluent.

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

EpC3—Eldean gravelly clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, well drained soil is on stream terraces. It is moderately deep over sand and gravel. Areas are elongated and are 5 to 40 acres in size.

Typically, the surface layer is brown gravelly clay loam about 8 inches thick. The subsoil is about 27 inches thick. The upper part is brown, firm clay loam. The next part is reddish brown, firm gravelly clay and gravelly sandy clay. The lower part is dark reddish brown, firm gravelly clay. The substratum to a depth of 60 inches is yellowish brown, loose, stratified coarse sand and gravelly coarse sand. In some places the subsoil has less clay. In other places the subsoil and substratum do not have coarse fragments. In some areas sand and gravel are at a depth of more than 40 inches. In other areas the surface layer is loam or clay loam. In some places the substratum is glacial till. In other places the slope is less than 6 or more than 12 percent.

Included with this soil in mapping are small areas where sand and gravelly sand are at or near the surface. Included soils make up about 2 percent of this map unit.

Permeability is moderately slow in the subsoil of the Eldean soil and rapid in the substratum. The available water capacity is low. The organic matter content is low in the surface layer. Runoff is rapid. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas are used for cultivated crops or pasture. Some are used for woodland.

This soil is poorly suited to corn, soybeans, and small grain. Small grain can be grown in rotation with hay or pasture plants. A severe hazard of erosion is the main management concern. Measures that control erosion and surface runoff are needed if cultivated crops are grown. A cropping sequence that includes grasses and legumes, diversions, terraces, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface conserve moisture, help to control erosion, improve tilth, and maintain the organic matter content. The soil is droughty during extended dry periods. It is well suited to no-till farming.

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

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the slope, this soil is moderately limited as a site for dwellings. A shrink-swell potential is an additional limitation for dwellings without basements. Strengthening footings and foundations and backfilling with sand and gravel help to prevent the structural damage caused by shrinking and swelling. The instability of cutbanks is a concern in shallow excavations. Trench walls should be reinforced. Grading the slope or designing the dwellings so that they conform to the natural slope of the land helps to compensate for the slope. Erosion can be controlled by developing only random lots rather than extensive areas and by retaining as much of the existing vegetation as possible. It also can be controlled by building roads on the contour, by establishing diversions between lots to intercept the runoff, and by stockpiling topsoil to be reapplied and reseeded after construction.

Because of low strength, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

Because of a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. The absorption fields should be installed away from sources of drinking water. Filling or mounding the absorption field with suitable material improves the capacity of the field to filter the effluent.

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

EsB2—Eldean Variant silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is on stream terraces. It is moderately deep over stratified gravelly loamy sand and very gravelly sand. Areas are irregularly shaped and are 3 to 25 acres in size.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 20 inches thick. The upper part is dark yellowish brown, firm clay loam and clay, and the lower part is dark yellowish brown, firm gravelly clay loam. The substratum to a depth of 60 inches is stratified, dark yellowish brown very gravelly coarse sandy loam to loamy coarse sand. In some areas the hazard of erosion is severe. In a few places the soil has less sand and more silt. In some small areas the substratum is at a depth of less than 24 or more than 60 inches. In some areas the soil has less clay. In a few areas stratified loam and silty material are in the upper part of the substratum. In a few other areas the upper part of the subsoil has more gravel. In some small areas glacial till is at a depth of about 40 inches. In some places the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are small areas of the well drained Belmore Variant soils on the lower summits and the somewhat poorly drained Digby soils on the lower flats. Belmore Variant soils have more sand in the solum than the Eldean Variant soil. Also included are some small areas of the very poorly drained Millgrove soils in depressions. Included soils make up about 10 percent of the map unit.

Permeability is moderately slow in the subsoil of the Eldean Variant soil and rapid in the substratum. The available water capacity is moderate. The organic matter content is moderate in the surface layer. Runoff is rapid. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay, pasture, or specialty crops.

This soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. It can be reduced by constructing water- and sediment-control basins, terraces, and diversions, including grasses and legumes in the crop rotation, installing grade stabilization structures, or using a combination of these practices. Grassed waterways help to control erosion in drainageways. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops improve tilth and maintain the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass or orchardgrass, and legumes, such as alfalfa, for hay and pasture. The hazard of erosion is the main management concern. A cover of grasses and legumes is effective in controlling erosion. Overgrazing reduces the plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use when the soil is wet help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is suitable as a site for dwellings with basements. The instability of cutbanks is a concern in shallow excavations. Trench walls should be reinforced. Strengthening foundations and footings and backfilling with sand and gravel help to prevent the structural damage caused by shrinking and swelling.

Because of low strength, this soil is severely limited as a site for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by low strength.

Because of a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. Filling the absorption field with a suitable material improves the capacity of the field to filter the effluent. The absorption fields should be installed away from sources of drinking water.

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

GnB2—Glynwood silt loam, 2 to 5 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is on ridges and knolls on till plains and moraines. Areas are irregular in shape and are 2 to 50 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 15 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is yellowish brown, mottled, firm clay loam and silty clay loam. The substratum to a depth of 60 inches is yellowish brown silty clay loam. In a few small areas the upper part of the soil is loam. In some areas the solum is more than 40 inches thick over glacial till. In other areas the surface layer is silty clay loam or clay loam.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Blount soils in the lower landscape positions. Also included are the well drained Morley and moderately well drained Rawson Variant soils on slope breaks and the very poorly drained Pewamo soils in shallow depressions. Rawson Variant soils have more sand in the surface layer and subsoil than the Glynwood soil. Included soils make up about 13 percent of the map unit.

Permeability of the Glynwood soil is slow. The available water capacity is moderate. The organic matter content is moderate in the surface layer. Runoff is rapid. The water table is at a depth of 2.0 to 3.5 feet in winter and early in spring. The surface layer may crust after periods of rainfall.

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

This soil is fairly well suited to corn, soybeans, and small grain. Measures that control erosion are needed if cultivated crops are grown. Including grasses and legumes in the crop rotation, constructing terraces and grassed waterways, and installing grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to control erosion, maintain the organic matter content, and improve tilth. Subsurface drains are needed to remove water from seep areas in some of the drainageways and swales. The soil is well suited to no-till farming.

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

This soil is well suited to trees. The main management concerns are seedling mortality, the windthrow hazard, and plant competition. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Subsurface drains help to lower the water table.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Replacing or covering the upper soil layers with suitable base material and providing roadside ditches help to prevent the damage caused by frost action. Replacing or strengthening the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. A subsurface perimeter drainage system reduces the wetness. Filling or mounding the absorption field with suitable material, enlarging the absorption field, and controlling the rate of flow from the holding tank improve the capacity of the field to absorb the effluent.

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

GpB3—Glynwood clay loam, 2 to 6 percent slopes, severely eroded. This deep, gently sloping, moderately well drained soil is on narrow ridgetops and side slopes along natural drainageways on till plains. Areas are narrow and irregularly shaped and are 5 to 500 acres in size.

Typically, the surface layer is dark yellowish brown clay loam about 5 inches thick. Most of the original dark surface layer has been removed by erosion, and the rest has been mixed by tillage with the upper part of the subsoil. The subsoil is about 15 inches of dark yellowish brown and yellowish brown, firm clay loam. The substratum to a depth of 60 inches is yellowish brown, calcareous clay loam. In some areas the solum is thinner. In a few places the surface layer is dark brown and dark yellowish brown. In some places the lower part of the subsoil has gray mottles. In a few areas the surface layer is loam or silt loam. In some areas calcareous till is at the surface. In a few places gravel or small stones are on the surface.

Included with this soil in mapping are small areas of the well drained Morley soils on the wider ridgetops. Also included are the somewhat poorly drained Blount soils on broad flats and slight rises. Included soils make up about 8 percent of the map unit.

Permeability is slow in the Glynwood soil. The available water capacity is moderate. The organic matter content is moderately low in the surface layer. Runoff is rapid. The water table is at a depth of 2.0 to 3.5 feet in winter and early in spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked. The clods are hard when dry and make seedbed preparation difficult.

Most areas are used for cultivated crops. Some are used for pasture, hay, woodland, wildlife habitat, and recreational development.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard. If cultivated crops are grown, practices to control erosion and surface runoff are needed. Including grasses and legumes in the crop rotation, constructing terraces and grassed waterways, and installing grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to improve tilth and maintain the organic matter content. Surface drainage is needed to remove water from seep areas in some of the drainageways and swales. The soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa and ladino clover, for pasture and hay. The hazard of erosion is the main management concern. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, poor tilth, and excessive runoff and reduces the plant density. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Footing and foundation drains help to lower the water table. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the base with better suited material helps to prevent the damage caused by low strength and frost action and improves the ability of the roads and streets to support vehicular traffic. Providing adequate roadside ditches and installing culverts help to prevent the damage caused by frost action.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. A subsurface perimeter drainage system helps to lower the water table. Enlarging the size of the absorption field, controlling the rate of flow from the holding tank, and filling or mounding the absorption field with suitable material improve the capacity of the field to absorb the effluent.

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

GtA—Glynwood Variant silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on slight rises in terracelike positions on till plains. Areas are irregular in shape and are 5 to 60 acres in size.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown, firm clay loam, and the lower part is dark yellowish brown and yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches is yellowish brown, firm, calcareous clay loam. In some places the soil is silty to a depth of more than 20 inches and has a subsoil that has less sand in the upper part. In other places the surface layer is loam, sandy loam, or fine sandy loam. In some areas sand and gravel are at a depth of about 70 inches. In other areas the lower part of the subsoil is sandy clay loam or sandy loam. In places the solum is less than 40 inches thick.

Included with this soil in mapping are the well drained Eldean and Morley soils on the slightly higher rises. Also included are small areas of soils that have stones on the surface and in the subsoil. Included soils make up about 10 percent of the map unit.

Permeability is moderately slow in the Glynwood Variant soil. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 2.0 to 3.5 feet in winter and early in spring. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content.

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

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

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa and ladino clover, for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and reduces the plant density and hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Subsurface drains help to lower the water table.

Because of low strength, the soil is severely limited as a site for local roads and streets. Replacing or strengthening the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by low strength and improve the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the moderately slow permeability, this soil is severely limited as a site for septic tank absorption fields. A subsurface perimeter drainage system reduces the wetness. Filling or mounding the absorption field with suitable material, enlarging the field, and controlling the rate of flow from the holding tank improve the capacity of the field to absorb the effluent.

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

HaA—Haney silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on stream terraces along the valleys of major streams. Areas are elongated or irregularly shaped and are 5 to 50 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 57 inches thick. The upper part is brown, firm silt loam. The next part is brown, firm sandy clay loam. The lower part is brown, very gravelly clay loam, very gravelly sandy clay loam, and extremely gravelly coarse sandy loam. The substratum to a depth of 80 inches is yellowish brown, calcareous gravelly loamy coarse sand and gravelly coarse sandy loam. In some places the surface layer is sandy loam or clay loam. In other places the subsoil is silty clay. In a few small areas the substratum is glacial till or stratified silt and sand.

Included with this soil in mapping are the well drained Belmore Variant and Eldean Variant and moderately well drained Rawson Variant soils in the slightly higher positions. Rawson Variant soils have more sand in the solum and more clay in the substratum than the Haney soil. Also included are the somewhat poorly drained Digby soils on broad flats and the very poorly drained Millgrove soils in depressions. Included soils make up 5 to 8 percent of the map unit.

Permeability is moderate in the subsoil of the Haney soil and rapid in the substratum. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 1.5 to 3.0 feet in winter and early in spring. The soil is droughty in summer and early in fall. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content.

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

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

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

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the wetness, this soil is moderately limited as a site for dwellings without basements and is severely limited as a site for dwellings with basements. The instability of cutbanks is a concern in shallow excavations. Subsurface drains help to lower the water table.

Because of frost action, this soil is severely limited as a site for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action and improves the ability of the roads and streets to support vehicular traffic.

Because of the wetness and a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. Perimeter subsurface drains help to lower the water table. Absorption fields should be installed in areas away from sources of drinking water. Filling or mounding the absorption field with suitable material improves the capacity of the field to filter the effluent.

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

HbA—Haskins Variant loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is in slightly raised areas on till plains and moraines. Areas are irregular in shape and are 3 to 30 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsurface layer is about 5 inches of brown loam. The subsoil is about 24 inches of dark yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled, firm clay loam. In some areas the surface layer is sandy loam. In a few small areas the surface layer and subsoil have more clay. In places the substratum is stratified silt loam and sandy loam or is gravelly coarse sandy loam.

Included with this soil in mapping are small areas of the moderately well drained Rawson Variant and Glynwood soils in the higher positions on the landscape and a few areas that are severely eroded. Also included are the very poorly drained Pewamo soils in the lower positions on the landscape. Included soils make up about 8 percent of the map unit.

Permeability is moderate in the subsoil of the Haskins Variant soil and moderately slow in the substratum. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 1.0 to 2.5 feet in winter and early in spring. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Surface and subsurface drains reduce the wetness. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain the organic matter content and improve tilth.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as ladino clover and red clover, for hay or pasture. It is less well suited to deep-rooted legumes, such as alfalfa, than to shallow-rooted legumes. The wetness is the main management concern. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains help to lower the water table.

Because of frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by frost action and improve the ability of the roads to support vehicular traffic.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. A subsurface perimeter drainage system lowers the water table. Enlarging the absorption field, controlling the rate of flow from the holding tank, and filling or mounding the absorption field with suitable material improve the capacity of the field to absorb the effluent.

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

Mh—Milford silty clay loam. This deep, nearly level, very poorly drained soil is in depressions on till plains. It is frequently ponded by runoff from the higher adjacent slopes. Areas are elongated or oval in shape and are 3 to 500 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 11 inches thick. The subsurface layer is about 4 inches of very dark gray silty clay loam. The subsoil is about 42 inches thick. The upper part is dark gray, mottled, firm clay loam and silty clay loam, and the lower part is grayish brown, mottled, firm silty clay, silty clay loam, and clay loam. The substratum to a depth of 65 inches is grayish brown, mottled clay loam that has thin strata of sandy loam. In a few small areas the soil is underlain by glacial till or limestone at a depth of less than 60 inches. In some areas the subsoil has less clay and more silt.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Del Rey soils in the slightly higher positions on the landscape. Also included are small areas of the very poorly drained Wallkill soils in potholes. Wallkill soils are underlain by muck. Included soils make up 4 to 8 percent of the map unit.

Permeability is moderately slow in the Milford soil. The available water capacity is high. The organic matter content is high in the surface layer. Runoff is very slow or ponded. The water table is at or above the surface in spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Excess water can be removed by subsurface drains, surface drains, or pumps or by a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface maintains the organic matter content and improves tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as reed canarygrass, and shallow-rooted legumes, such as ladino clover, for hay or pasture. The wetness is the main management concern. A complete drainage system is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of frost action, the ponding, and low strength, the soil is severely limited as a site for local roads. Constructing roads on raised, well compacted fill material, providing roadside ditches, and installing culverts minimize the damage caused by frost action, ponding, and low strength and improve the ability of the roads to support vehicular traffic.

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

Mk—Milford silty clay loam, stratified sandy substratum. This deep, nearly level, poorly drained soil is in sluiceways on till plains. It is frequently ponded by runoff from the higher adjacent slopes. Areas are elongated or oval and are 3 to 500 acres in size.

Typically, the surface layer is very dark gray silty clay loam about 10 inches thick. The subsurface layer is about 4 inches of very dark gray silty clay loam. The subsoil is about 44 inches thick. The upper part is gray, mottled, firm silty clay loam and clay loam. The lower part is gray, mottled, firm silty clay loam that has thin strata of silt loam and loam. The substratum to a depth of 65 inches is gray silt loam that has strata of loamy sand and sand. In a few small areas the soil is underlain by glacial till at a depth of less than 65 inches. In some areas the subsoil has less clay and more silt.

Included with this soil in mapping are areas of the somewhat poorly drained Del Rey soils in the slightly higher positions on the landscape. Also included are small areas of the very poorly drained Wallkill soils in potholes. Wallkill soils have less sand and more muck in the substratum than the Milford soil. Included soils make up 4 to 8 percent of the map unit.

Permeability is moderately slow in the subsoil of the Milford soil and moderate in the substratum. The available water capacity is high. The organic matter content is high in the surface layer. Runoff is very slow or ponded. The water table is at or above the surface in winter and spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

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

If drained, this soil is fairly well suited to corn and soybeans. The ponding is the main hazard. The wetness is the main limitation. Excess water can be removed by subsurface drains, surface drains, or pumps or by a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface maintains the organic matter content and improves tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as reed canarygrass, and shallow-rooted legumes, such as ladino clover, for hay or pasture. The wetness is the main management concern. A complete drainage system is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of frost action, the ponding, and low strength, this soil is severely limited as a site for local roads. Constructing roads on raised, well compacted fill material, providing roadside ditches, and installing culverts minimize the damage caused by frost action, ponding, and low strength and improve the ability of the roads to support vehicular traffic.

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

Mn—Millgrove clay loam. This deep, nearly level, very poorly drained soil is on stream terraces. It is frequently ponded by runoff from higher adjacent slopes. Areas are long and narrow or irregularly shaped and are 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown clay loam about 8 inches thick. The subsurface layer is about 6 inches of very dark gray clay loam. The subsoil is about 38 inches thick. The upper part is very dark gray and grayish brown, mottled, firm clay loam, and the lower part is yellowish brown and dark gray, mottled, firm clay loam and sandy clay loam. The substratum extends to a depth of 60 inches. The upper part is yellowish brown, calcareous gravelly sandy loam, and the lower part is yellowish brown, calcareous gravelly coarse sandy loam and gravelly loamy sand. In places the upper part of the subsoil has more clay. In a few areas the soil is underlain by stratified silt and sand.

Included with this soil in mapping are areas of the well drained Belmore Variant and Eldean Variant, somewhat poorly drained Digby, and moderately well drained Haney soils. These soils are in the slightly higher positions on the landscape. Also included are some small areas of soils that are ponded for long periods. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil of the Millgrove soil and moderately rapid in the substratum. The available water capacity is high. The organic matter content is high in the surface layer. Runoff is very slow or ponded. The water table is at or above the surface in winter and early in spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The ponding is the main hazard. The wetness is a limitation. Some areas between streams are too narrow to crop. Most areas have been drained, but

Figure 6.—A surface drainage ditch in an area of Millgrove clay loam helps to lower the water table.

additional drainage may be needed if cultivated crops are grown. Shallow surface drains remove excess surface water (fig. 6). A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops maintain the organic matter content and improve tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay and pasture. The wetness is the main limitation. The ponding is a hazard. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Prolonged seasonal wetness hinders harvesting and the planting of seedlings. These operations should be performed only when the soils are relatively dry or frozen. Planting larger, older seedlings or increasing the number of seedlings reduces the seedling mortality rate. Harvesting methods that do not leave trees standing alone or widely spaced reduce the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of the ponding and frost action, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, providing roadside ditches, and installing culverts minimize the damage caused by ponding and frost action and improve the ability of the roads to support vehicular traffic.

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

Mo—Millsdale silty clay loam. This moderately deep, nearly level, very poorly drained soil is in slight depressions on bedrock terraces. It is underlain by dolomitic limestone. The soil is ponded by surface runoff from adjacent higher areas. Areas are long and narrow or are irregularly shaped. They are 3 to 25 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 9 inches thick. The subsurface layer is about 4 inches of very dark gray silty clay loam. The subsoil is about 13 inches thick. The upper part is very dark grayish brown and dark grayish brown, mottled, firm silty clay loam. The lower part is gray, mottled, firm silty clay. Hard limestone is at a depth of 26 inches. In some areas the subsoil has less clay. In other areas the soil is underlain by soft limestone. In a few areas the soil is underlain by strata of silty and clayey material. In some areas, the subsoil and substratum are glacial till and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are the well drained Milton Variant soils on rises. Also included are the somewhat poorly drained Randolph soils in the more nearly level areas on rises. Included soils make up about 12 percent of the map unit.

Permeability is moderately slow in the Millsdale soil. The available water capacity is low. The organic matter content is high in the surface layer. Runoff is very slow or ponded. The water table is near or above the surface in winter and early in spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked. The clods are hard when dry and make seedbed preparation difficult. Root development is restricted below a depth of about 29 inches.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. The ponding is the major hazard. The wetness is a limitation. Drainage is needed if cultivated crops are grown. Land smoothing and shallow surface drains help to remove excess surface water. In most areas the bedrock interferes with the installation of subsurface drains. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops maintain the organic matter content and improve tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay and pasture. The ponding is a hazard. The wetness is a limitation. Drainage is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and reduces the plant density and hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Prolonged seasonal wetness hinders harvesting and the planting of seedlings. These operations should be performed only when the soil is relatively dry or frozen. Planting larger, older seedlings or increasing the number of seedlings helps to compensate for the seedling mortality rate. Harvesting methods that do not leave trees standing alone or widely spaced reduce the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, and girdling unwanted trees and shrubs.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. This soil is severely limited as a site for local roads because of low strength, the ponding, and a shrink-swell potential. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and shrinking and swelling. Constructing roads on raised, well compacted fill material, providing roadside ditches, and installing culverts minimize the damage caused by the ponding.

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

MsA—Milton Variant silt loam, 0 to 2 percent slopes. This shallow, nearly level, well drained soil is on narrow rises on bedrock terraces. It is underlain by dolomitic limestone. Areas are long and irregularly shaped. They range from 3 to 25 acres in size, but most are about 5 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is about 3 inches of brown silt loam. The subsoil is about 5 inches of dark yellowish brown, firm clay. Hard limestone is at a depth of about 18 inches. In some places the solum is thinner, and in other places it is thicker. In some areas the soil is underlain by soft, weathered limestone. In other areas the subsoil is loamy. In a few areas, the subsoil and substratum are glacial till and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are the somewhat poorly drained Randolph soils on the lower flats and the very poorly drained Millsdale soils in shallow drainageways. Also included are small areas that have a channery surface layer or have bedrock exposed at the surface and small areas that have a surface layer of clay or clay loam. Included soils make up about 15 percent of the map unit.

Permeability is moderately slow in the Milton Variant soil. The available water capacity is low. The organic matter content is moderate in the surface layer. Runoff is slow. Root development is restricted below a depth of about 18 inches.

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

This soil is fairly well suited to corn, soybeans, and small grain. A shallow root zone is the main limitation. A system of conservation tillage that leaves protective amounts of crop residue on the surface conserves moisture, improves tilth, and maintains the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as red clover, for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, however, because of the shallow depth to limestone. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition.

Because of the depth to bedrock, this soil is severely limited as a site for dwellings. Constructing the buildings on raised, well compacted fill material helps to compensate for the depth to bedrock.

Because of the depth to bedrock, this soil is severely limited as a site for local roads and streets. Providing thick, coarser grained subgrade and base material increases the ability of the roads and streets to support vehicular traffic.

Because of the depth to bedrock and a seepage potential, this soil is severely limited as a site for septic tank absorption fields. Overcoming these limitations generally is infeasible; therefore, an alternative site should be considered. Filling or mounding the absorption field with suitable material improves the capacity of the field to absorb the effluent.

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

MuB2—Morley loam, moderately slow permeability, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on rises in terracelike areas along the major streams on till plains and moraines. Areas are irregular in shape and are 3 to 80 acres in size.

Typically, the surface layer is brown loam about 9 inches thick. In some areas the surface layer has been mixed with the upper part of the subsoil. The subsoil is about 25 inches thick. The upper part is yellowish brown and dark yellowish brown clay loam, and the lower part is brown, firm clay loam. The substratum to a depth of 60 inches is brown, firm, calcareous clay loam. In some places sand and gravel that contain a considerable amount of silt and clay are below a depth of 8 feet. In other places the soil has a cap of silt more than 15 inches thick and has less sand in the upper part of the subsoil. In some severely eroded areas, the surface layer is clay loam. In a few areas the substratum has more sand and gravel. In some areas the substratum is stratified gravelly coarse sand. In other areas the substratum is within a depth of 16 inches.

Included with this soil in mapping are the well drained Eldean and moderately well drained Glynwood Variant soils on the slightly lower rises. Eldean soils have more gravel in the subsoil than the Morley soil. Included soils make up about 12 percent of the map unit.

Permeability is moderately slow in the Morley soil. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is rapid. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is a hazard. Practices to control surface runoff and erosion are needed if cultivated crops are grown. A cropping system that includes grasses and legumes, terraces, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to improve tilth and maintain the organic matter content. Subsurface drains are needed to remove excess water from seep areas in some of the drainageways and swales. The soil is well suited to no-till farming.

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

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling.

Because of low strength, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the subgrade or base material with better suited material helps to prevent the damage caused by low strength and improves the ability of the roads and streets to support vehicular traffic.

Because of the moderately slow permeability, this soil is moderately limited as a site for septic tank absorption fields. Enlarging the septic tank absorption field or filling or mounding the system with a better suited material improves the capacity of the field to absorb the effluent.

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

MuE—Morley loam, 15 to 30 percent slopes. This deep, strongly sloping to steep, well drained soil is on the side slopes of till plains and moraines. Areas are irregular in shape and are 3 to 15 acres in size.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsoil is about 22 inches thick. The upper part is brown, firm clay loam. The next part is dark yellowish brown, firm clay. The lower part is yellowish brown, very firm silty clay loam. The substratum to a depth of 60 inches is yellowish brown clay loam. In a few small areas the surface layer is silt loam.

Included with this soil in mapping are a few small areas that have slopes of more than 45 percent. Also included are small areas that are severely eroded and have a surface layer of clay loam. Included soils make up 4 to 8 percent of the map unit.

Permeability is slow in the Morley soil. The available water capacity is moderate. The organic matter content is moderately low in the surface layer. Runoff is very rapid. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas are used for woodland. A few are used for hay or pasture. This soil is generally unsuited to cultivated crops because of the slope.

This soil is poorly suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay. It is fairly well suited to pasture. The slope and a hazard of erosion are the main management concerns. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation, the erosion hazard, and plant competition. Special techniques, such as yarding logs uphill with a cable, may be needed to minimize the use of rubber-tired vehicles. Establishing roads, skid trails, and landings on gentle grades reduces the erosion hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Because of the slope and low strength, the soil is severely limited as a site for local roads. Constructing the roads on the contour and land shaping help to overcome the slope. Strengthening or replacing the base with better suited material minimizes the damage caused by low strength and improves the ability of the roads to support vehicular traffic.

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

MvC2—Morley silt loam, 4 to 8 percent slopes, eroded. This deep, gently sloping to moderately sloping, well drained soil is on till plains and moraines. Areas are irregular in shape and are 2 to 50 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 21 inches of firm silty clay loam. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of 60 inches is yellowish brown silty clay loam and clay loam. In a few small areas the upper part of the soil has more sand and less clay. In some places the substratum is stratified silt loam and sandy loam. In other places the surface layer is clay loam or silty clay loam.

Included with this soil in mapping are the somewhat poorly drained Blount soils in the lower positions on the landscape and the moderately well drained Glynwood soils on the lower parts of summits. Included soils make up 8 to 12 percent of the map unit.

Permeability is slow in the Morley soil. The available water capacity is high. The organic matter content is moderately low in the surface layer. Runoff is rapid. If tilled when wet, this soil becomes cloddy and cannot be easily worked.

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

This soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard. Practices that help to control erosion and runoff are needed if cultivated crops are grown. A cropping system that includes grasses and legumes, terraces, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to control erosion, maintain the organic matter content, and improve tilth. Subsurface drains are needed to remove excess water from seep areas in some of the drainageways and swales. The soil is well suited to no-till farming.

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

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling.

Because of low strength, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

Because of the slow permeability, this soil is severely limited as a site for septic tank absorption fields. Filling or mounding the absorption field with suitable material improves the capacity of the field to absorb the effluent.

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

MxC3—Morley clay loam, 6 to 12 percent slopes, severely eroded. This deep, moderately sloping, well drained soil is on ridges and side slopes on till plains and moraines. Areas are irregular in shape and are 3 to 30 acres in size.

Typically, the surface layer is brown clay loam about 6 inches thick. Most of the original surface layer has been removed by erosion, and the rest has been mixed by tillage with the subsoil. The subsoil is about 14 inches thick. The upper part is dark yellowish brown, firm silty clay, and the lower part is yellowish brown, firm silty clay loam. The substratum to a depth of 60 inches is yellowish brown silty clay loam. In a few small areas the surface layer is silt loam or loam. In some areas calcareous till is at the surface.

Included with this soil in mapping are the moderately well drained Glynwood soils in the less sloping areas and the very poorly drained Coesse soils in narrow depressions. Included soils make up 4 to 8 percent of the map unit.

Permeability of the Morley soil is slow. The available water capacity is moderate. The organic matter content is moderately low in the surface layer. Runoff is rapid. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

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

Because of a severe erosion hazard, this soil is poorly suited to corn and soybeans. Small grain can be grown in rotation with hay or pasture plants. Practices that control erosion and runoff are needed if cultivated crops are grown. A cropping system that includes grasses and legumes, terraces, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to control erosion, maintain the organic matter content, and improve tilth. The soil is well suited to no-till farming.

This soil is fairly well suited to grasses, such as bromegrass, and legumes, such as alfalfa, for hay. It is well suited to pasture. A hazard of erosion and the moderate available water capacity are the main management concerns. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls, backfilling with coarse textured material, and installing foundation drains help to prevent the structural damage caused by shrinking and swelling. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Because of low strength, this soil is severely limited as a site for local roads and streets. Replacing or strengthening the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

Because of the slow permeability, this soil is severely limited as a site for septic tank absorption fields. Filling or mounding the absorption field with suitable material improves the capacity of the field to absorb the effluent.

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

Pg—Pella silty clay loam, till substratum. This deep, nearly level, poorly drained soil is in depressions on broad till plains. It is frequently ponded by runoff from adjacent areas. Areas are oval or are long and irregularly shaped. They are 5 to 150 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 26 inches of grayish brown, mottled, firm silty clay loam. The substratum extends to a depth of 60 inches. The upper part is grayish brown, mottled, calcareous silty clay loam, and the lower part is gray and yellowish brown, calcareous clay loam. In some areas the surface layer is darker and thicker. In other areas the solum is thicker. In places the subsoil has more clay. In a few areas the substratum has strata of sandy loam or loamy fine sand.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Blount, Del Rey, and Haskins Variant soils on slight rises. Also included are the very poorly drained Wallkill soils in potholes. Included soils make up about 10 percent of the map unit.

Permeability is moderately slow in the Pella soil. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is very slow. The water table is at or above the surface in winter and early in spring. If tilled when wet, the surface layer becomes cloddy and hard to work, making seedbed preparation difficult.

Most areas are used for cultivated crops. A few are used for hay, pasture, woodland, or specialty crops.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness and the ponding are the main concerns. Most areas have been drained by subsurface drains, surface drains, or both. Conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and improve tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay or pasture. The wetness is the main management concern. Adequate drainage is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and reduces the plant density and hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Because of low strength, the ponding, and frost action, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by low strength, ponding, and frost action and improve the ability of the roads to support vehicular traffic.

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

Pk—Pella mucky silty clay loam, sandy substratum. This deep, nearly level, poorly drained soil is in depressions on broad till plains. It is often ponded by runoff from adjacent higher soils. Areas generally are oval and are 50 to 640 acres in size.

Typically, the surface layer of the Pella soil is black mucky silty clay loam about 10 inches thick. The subsurface layer is about 4 inches of very dark grayish brown silty clay loam. The subsoil is about 24 inches of grayish brown and dark grayish brown, mottled, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is grayish brown and light olive brown, mottled, firm silt loam. It has thin strata of loamy sand and sand in the lower part. In some areas the solum is more than 40 inches thick. In other areas the surface layer or subsoil has more clay. In a few places the substratum contains gravel and sand.

Included with this soil in mapping are the somewhat poorly drained Haskins Variant soils on rises and the very poorly drained Wallkill soils in potholes. Included soils make up about 5 percent of the map unit.

Permeability is moderate in the Pella soil. The available water capacity is high. The organic matter content is very high in the surface layer. Runoff is slow to ponded. The water table is at or above the surface from fall to spring. The organic material subsides during dry periods.

Most areas are used for cultivated crops. Some are used for hay, pasture, or specialty crops. A few are used for wildlife habitat or woodland.

If drained, these soils are well suited to corn, soybeans, small grain, and tomatoes. The ponding is the main hazard. The wetness is a limitation. Most areas have been drained by subsurface drains, surface drains, or both. Additional drainage is needed in some areas. Soil blowing is a hazard when the soil is dry. It can be controlled by planting a cover crop, such as rye or wheat. The soil is well suited to ridge-till farming.

These soils are well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay or pasture. The wetness is the main limitation. Adequate drainage is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and reduces the plant density and hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of low strength, the ponding, and frost action, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by low strength, ponding, and frost action and improve the ability of the roads to support vehicular traffic.

The land capability subclass is IIw. A woodland ordination symbol is not assigned.

Pm—Pewamo silty clay loam. This deep, nearly level, very poorly drained soil is in depressions on till plains and moraines. It is frequently ponded by runoff from adjacent slopes. Areas are irregular in shape and are 3 to 600 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 45 inches of mottled, firm silty clay and silty clay loam. The upper part is dark gray, and the lower part is gray and grayish brown. The substratum to a depth of 65 inches is gray, mottled silty clay loam. In a few small areas the dark surface layer is less than 10 inches thick. In some areas lighter colored material has been deposited on the original dark surface layer. In other areas the surface layer and subsoil are less clayey and are underlain by lacustrine material of silty clay or by limestone. In some places the soil is loamy outwash material. In other places the slope is more than 2 percent.

Included with this soil in mapping are the very poorly drained Coesse soils in deep depressions. Coesse soils do not have a thick, dark surface layer. Also included are the somewhat poorly drained Blount, Del Rey, and Haskins Variant soils on swells and the moderately well drained Glynwood soils in the higher positions on the landscape. Included soils make up about 7 percent of the map unit.

Permeability is moderately slow in the Pewamo soil. The available water capacity is high. The organic matter content is high. Runoff is very slow or ponded. The water table is at or above the surface in winter and spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Excess water can be removed by subsurface drains, surface drains, or pumps or a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and improves tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as reed canarygrass, and shallow-rooted legumes, such as ladino clover, for hay or pasture. The wetness is the major limitation. Adequate drainage is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of low strength, the ponding, and frost action, this soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by low strength, ponding, and frost action and improve the ability of the roads to support vehicular traffic.

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

Py—Pits, quarry. This map unit consists of open excavations from which limestone or sand and gravel have been removed. Some pits are shallow, and others are as much as 30 feet deep. Some contain water. Areas are 2 to 40 acres in size.

The gravel pits typically are along the edge of moraines or in stream valleys. Generally, a thick overburden of clayey material has been removed. The limestone pits are of limited extent. A thick overburden also has been removed from these pits.

Abandoned pits have little value for farming. They are suitable for use as wildlife habitat and recreation areas, especially those that contain enough water to support fish. Those that contain water also are excellent watering places for deer and other wildlife.

No land capability classification or woodland ordination symbol is assigned.

RdA—Randolph silt loam, 0 to 2 percent slopes. This moderately deep, nearly level, somewhat poorly drained soil is on rises on bedrock terraces. Areas are long and irregular in shape. They range from 3 to 35 acres in size, but most are about 10 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 16 inches thick. The upper part is yellowish brown, mottled, firm silty clay loam. The lower part is yellowish brown, mottled, firm clay loam. Hard limestone is at a depth of about 25 inches. In a few small areas the surface layer has less clay. In some places the slope is more than 2 percent. In other places the subsoil is dominantly clay loam or sandy clay loam. In some areas the soil is underlain by soft limestone. In other areas, the substratum is glacial till or stratified silty lacustrine deposits and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are the well drained Milton Variant soils on knolls and short, uneven side slopes and the very poorly drained Millsdale soils in depressions and shallow drainageways. Also included are a few small areas where bedrock is exposed at the surface and other areas, on the slightly higher rises, that have a stony or channery surface layer. Included soils make up about 12 percent of the map unit.

Permeability is moderately slow in the Randolph soil. The available water capacity is low. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 1.0 to 2.5 feet late in winter and early in spring. Root development is restricted below a depth of about 25 inches.

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

This soil is fairly well suited to corn, soybeans, and small grain. The wetness is the main limitation. Most areas have been drained. Land smoothing and shallow surface drains help to remove excess surface water. In some areas the bedrock may interfere with the installation of subsurface drains. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and improves tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as bromegrass, and legumes, such as ladino clover, for hay or pasture. It is less well suited to deep-rooted legumes, such as alfalfa, than to shallow-rooted crops because of the wetness and the depth to bedrock. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the wetness, this soil is severely limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness and the depth to bedrock. Subsurface drains help to lower the water table. Constructing the buildings on raised, well compacted fill material helps to compensate for the wetness and the depth to bedrock.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the base with a better suited material improves the ability of the roads and streets to support vehicular traffic. Providing roadside ditches minimizes the damage caused by frost action.

Because of the wetness, the depth to bedcrock, and a seepage potential, this soil is severely limited as a site for septic tank absorption fields. Installing perimeter interceptor drains helps to lower the water table. Filling or mounding the absorption field with suitable material improves the capacity of the field to absorb and filter the effluent.

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

RIB—Rawson Variant fine sandy loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on ridges and knolls on till plains and moraines. Areas are generally irregularly shaped or round and are 3 to 20 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 7 inches thick. The subsoil is about 41 inches thick. The upper part is dark yellowish brown, friable loam, the next part is brown, firm sandy clay loam, and the lower part is brown, mottled, firm clay loam. The substratum to a depth of 60 inches is yellowish brown clay loam. In some areas the surface layer is loam or sandy loam. In other areas the solum is less than 40 inches thick. In a few places the subsoil is more clayey. In a few other places the substratum has more sand and less clay. In some areas the slope is more than 6 percent.

Included with this soil in mapping are the moderately well drained Glynwood soils on knobs and ridgetops. Glynwood soils have less sand in the surface layer and subsoil than the Rawson Variant soil. Also included are small areas of the somewhat poorly drained Haskins Variant soils in the more nearly level areas. Included soils make up 7 to 10 percent of the map unit.

Permeability is moderate in the subsoil of the Rawson Variant soil and slow in the substratum. The available water capacity is high. The organic matter content is moderately low in the surface layer. Runoff is medium. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content. The water table is at a depth of 2.5 to 4.0 feet in winter and early in spring.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. Practices that control erosion and runoff are needed if cultivated crops are grown. Including grasses and legumes in the crop rotation, constructing terraces and grassed waterways, and installing grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops improve tilth and maintain the organic matter content. Subsurface drains are needed to remove excess water from seep areas in some of the drainageways and swales. The soil is well suited to no-till farming.

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

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees.

Because of the wetness and a shrink-swell potential, this soil is moderately limited as a site for dwellings with basements. It is moderately limited as a site for dwellings without basements because of a shrink-swell potential. Subsurface drains help to lower the water table and reduce wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling.

Because of a shrink-swell potential and low strength, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and strengthening or replacing the base with better suited material minimize the damage caused by low strength and shrinking and swelling and improve the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. A subsurface perimeter drainage system lowers the water table. Enlarging the absorption field and controlling the rate of flow from the holding tank improve the ability of the field to absorb the effluent.

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

RIC—Rawson Variant fine sandy loam, 6 to 12 percent slopes. This deep, moderately sloping, moderately well drained soil is on side slopes on till plains and moraines. Areas are irregularly shaped or elongated and are 3 to 45 acres in size.

Typically, the surface layer is dark yellowish brown fine sandy loam about 7 inches thick. The subsoil is about 36 inches thick. The upper part is dark yellowish brown, firm fine sandy loam, and the lower part is dark yellowish brown, firm clay loam and sandy clay loam. The substratum to a depth of 60 inches is yellowish brown, calcareous clay loam. In some places the solum is thinner. In other places the surface layer is loam or silt loam. In some areas till that has texture of silty clay loam or clay loam is at the surface. In a few places the subsoil is more clayey. In some places the slope is more than 12 percent.

Included with this soil in mapping are the moderately well drained Glynwood soils on knolls and ridgetops. Glynwood soils have less sand in the surface layer and subsoil than the Rawson Variant soil. In a few areas gravel and small stones are on the surface. Included soils make up about 12 percent of the map unit.

Permeability is moderate in the subsoil of the Rawson Variant soil and slow in the substratum. The available water capacity is high. The organic matter content is moderately low in the surface layer. Runoff is medium. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The water table is at a depth of 2.5 to 4.0 feet in winter and early in spring.

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

This soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard. Practices that control erosion and runoff are needed if cultivated crops are grown. Including grasses and legumes in the crop rotation, constructing grassed waterways, and installing grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to improve tilth and maintain the organic matter content. Subsurface drains are needed to remove water from seep areas in some drainageways and swales. The soil is well suited to no-till farming.

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

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of a shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings without basements. It is moderately limited as a site for dwellings with basements because of the wetness, the slope, and a shrink-swell potential. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Subsurface drains help to lower the water table and reduce wetness. Constructing the buildings on raised, well compacted fill material helps to compensate for the wetness. Grading the slope or designing the buildings so that they conform to the natural slope of the land help to compensate for the slope. Retaining as much of the existing vegetation as possible during construction and revegetating disturbed areas as soon as possible help to control erosion.

Because of the slope, a shrink-swell potential, and low strength, this soil is moderately limited as a site for local roads and streets. Constructing the roads on the contour and land shaping help to overcome the slope. Constructing the roads and streets on raised, well compacted fill material and strengthening or replacing the base with better suited material minimize the damage caused by low strength and shrinking and swelling and improve the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. Filling or mounding the absorption field with a better suited material helps to compensate for the slow permeability. Enlarging the absorption field and controlling the rate of flow from the holding tank improve the capacity of the field to absorb the effluent. Installing subsurface drains around the outer edges of the absorption field helps to lower the water table.

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

Rr—Rensselaer loam. This deep, nearly level, very poorly drained soil is on terraces. It is occasionally ponded for short periods by runoff from surrounding areas. Areas are long and narrow or are irregularly shaped. They are 3 to 25 acres in size.

Typically, the surface layer is very dark grayish brown loam about 10 inches thick. The subsurface layer is about 6 inches of very dark grayish brown loam. The subsoil is about 27 inches thick. The upper part is dark grayish brown, mottled, friable silty clay loam. The next part is dark grayish brown, mottled, firm clay loam. The lower part is grayish brown, mottled, firm clay loam. The substratum extends to a depth of 70 inches. The upper part is yellowish brown, mottled loam, and the lower part is yellowish brown, mottled loam that has thin strata of sandy loam and loamy sand. In some areas the solum is thinner. In other areas the upper part of the subsoil has more silt. In places the substratum is gravelly coarse sandy loam and gravelly loamy sand.

Included with this soil in mapping are the moderately well drained Tuscola and somewhat poorly drained Whitaker soils in the slightly higher positions on the landscape. Also included are the very poorly drained Sloan soils on adjacent flood plains. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Rensselaer soil. The available water capacity is high. The organic matter content is high in the surface layer. Runoff is slow to ponded. The water table is at or above the surface in winter and early in spring. The surface layer is friable and is easily worked under proper moisture conditions. If tilled when wet, however, large clods form. The clods become firm when dry and make seedbed preparation difficult.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland (fig. 7).

This soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Some areas between streams are too narrow to crop. Most areas have been drained for cultivated crops, but additional drainage may be needed. Land smoothing and shallow surface drains help to remove excess water, which allows the soil to warm up faster in spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops help to maintain the organic matter content and improve tilth. The soil is well suited to fall plowing, fall chiseling, and ridge-till farming.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay or pasture. Adequate drainage is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Figure 7.—Typical wooded area of Rensselaer loam.

This soil is well suited to trees. The ponding is a hazard. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Prolonged seasonal wetness hinders harvesting and the planting of seedlings. These operations should be performed only when the soil is relatively dry or frozen. Planting larger, older seedlings or increasing the number of seedlings reduces the seedling mortality rate. Harvesting methods that do not leave trees standing alone or widely spaced reduce the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Because of the ponding, low strength, and frost action, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by ponding, frost action, and low strength and improve the ability of the roads to support vehicular traffic.

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

Rz—Ross loam, frequently flooded. This deep, nearly level, well drained soil is on flood plains. It is frequently flooded for brief periods late in winter and early in spring. Areas are 10 to 160 acres in size.

Typically, the surface layer is very dark grayish brown loam about 17 inches thick. The subsoil is about 33 inches of dark brown and dark yellowish brown, friable loam. The substratum to a depth of 60 inches is dark yellowish brown sandy loam. In some areas the lower part of the surface layer and the upper part of the subsoil are lighter colored and have more silt and clay. In other areas the surface layer has more sand. In some places the upper part of the soil has grayish brown mottles. In other places the substratum is gravelly coarse sandy loam, gravelly loam, loam, loamy sand, coarse sand, or silt loam.

Included with this soil in mapping are the moderately well drained Eel and somewhat poorly drained Shoals soils in the slightly lower positions on the landscape and the very poorly drained Sloan soils in depressions. Also included are areas that are not frequently flooded. Included soils make up about 15 percent of this map unit.

Permeability is moderate in the Ross soil. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 4 to 6 feet in winter and spring. The surface layer is friable and can be fairly easily tilled under proper moisture conditions.

Most areas are used for cultivated crops. Some are used for woodland.

This soil is well suited to corn, soybeans, and small grain. The flooding is the major hazard. Good surface drainage is needed so that crops can be planted after the floodwater recedes. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and improves tilth. Crops may need to be replanted as a result of damage from the flooding. The soil is well suited to spring plowing, spring chiseling, and no-till farming.

This soil is well suited to grasses and legumes for hay or pasture. The flooding may damage new seedlings. Overgrazing reduces the plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields and is severely limited as a site for local roads. Constructing roads on raised, well compacted fill material, providing roadside ditches, and installing culverts help to prevent the damage caused by flooding.

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

Se—Saranac silty clay loam, frequently flooded. This deep, nearly level, very poorly drained soil is on flood plains. It is frequently flooded for brief periods by overflow from streams. Most areas are elongated and are 3 to 200 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 45 inches thick. The upper part is dark gray, mottled, firm silty clay loam and silty clay, and the lower part is gray and grayish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches is gray, mottled clay loam. In some areas the surface layer is lighter colored. In a few areas the soil has more sand and less clay throughout. In places the substratum is more clayey.

Included with this soil in mapping are a few small areas of the well drained Armiesburg soils in the slightly higher positions on the landscape. Also included are areas that are not frequently flooded. These soils make up about 5 percent of the map unit.

Permeability is moderately slow in the Saranac soil. The available water capacity is high. The organic matter content is high in the surface layer. Runoff is very slow. The water table is at or near the surface from fall to early in spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland (fig. 8).

This soil is fairly well suited to corn and soybeans. The flooding and the wetness are the main management concerns. The flooding can result in some crop damage during the cropping season. Surface and subsurface drains can reduce the wetness. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain the organic matter content and improve tilth. The soil is well suited to ridge-till farming if the rows are parallel to the streams and the ridges are prepared in spring.

This soil is well suited to grasses, such as reed canarygrass, and shallow-rooted legumes, such as

Figure 8.—An area of Saranac silty clay loam, frequently flooded, which is well suited to trees. The surface drainage ditch helps to remove floodwater.

ladino clover, for hay or pasture. The wetness and the flooding are the main management concerns. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of the wetness, low strength, and the flooding, it is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by wetness, low strength, and flooding and improve the ability of the roads to support vehicular traffic.

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

Sp—Shoals loam, frequently flooded. This deep, nearly level, somewhat poorly drained soil is on flood plains. It is frequently flooded for brief periods by stream overflow. Areas are generally elongated and are 2 to 30 acres in size.

Typically, the surface layer is dark grayish brown loam about 10 inches thick. The subsurface layer is about 7 inches of brown loam. The substratum to a depth of about 60 inches is dark grayish brown, yellowish brown, and brown, mottled loam. In some areas the surface layer is darker. In other areas the substratum has more clay. In some places the soil is less frequently flooded.

Included with this soil in mapping are the well drained Ross and moderately well drained Eel soils in the slightly higher positions on the landscape. Also included are the very poorly drained Sloan soils in the lower areas. Included soils make up about 15 percent of the map unit.

Permeability is moderate in the Shoals soil. The available water capacity is high. The organic matter content is moderate. Runoff is slow. The water table is at a depth of 0.5 foot to 1.5 feet in winter and early in spring. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

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

This soil is well suited to corn and soybeans. The flooding and the wetness are the main management concerns. The flooding can result in some crop damage during the cropping season. Surface and subsurface drains reduce the wetness. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain the organic matter content and improve tilth.

This soil is well suited to grasses, such as reed canarygrass, and shallow-rooted legumes, such as ladino clover and red clover, for hay or pasture. The wetness and the flooding are the main management concerns. A good drainage system is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of the wetness, the flooding, and frost action, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, providing roadside ditches, and installing culverts minimize the damage caused by wetness, flooding, and frost action and improve the ability of the roads to support vehicular traffic.

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

Sv—Sloan silty clay loam, frequently flooded. This deep, nearly level, very poorly drained soil is on flood plains. It is frequently flooded for brief periods by stream overflow. Areas are elongated and are 3 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 11 inches thick. The subsoil is about 25 inches thick. The upper part is dark grayish brown, mottled, friable clay loam, and the lower part is dark gray, mottled, firm clay loam. The substratum to a depth of 60 inches is dark gray, grayish brown, and dark grayish brown, mottled, stratified clay loam, loam, silt loam, sandy loam, and gravelly sandy loam. In a few areas the subsoil has more clay. In some places the soil is less frequently flooded.

Included with this soil in mapping are the well drained Ross, moderately well drained Eel, and somewhat poorly drained Shoals soils in the slightly higher positions on the landscape. Included soils make up about 12 percent of the unit.

Permeability is moderate in the Sloan soil. The available water capacity is high. The organic matter content is high in the surface layer. Runoff is very slow. The water table is at or near the surface from late in fall to spring. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

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

If drained and protected from flooding, this soil is fairly well suited to corn and soybeans. The flooding can result in some crop damage during the cropping season. Subsurface drains reduce the wetness. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain the organic matter content and improve tilth. The soil is well suited to ridge-till farming if the rows are parallel to the streams and the ridges are prepared in spring.

This soil is well suited to grasses, such as reed canarygrass, and shallow-rooted legumes, such as ladino clover, for hay or pasture. The wetness and the flooding are the main management concerns. Adequate drainage is needed for maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Because of the wetness, low strength, and the flooding, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing roadside ditches, and installing culverts minimize the damage caused by wetness, low strength, and flooding and improve the ability of the roads to support vehicular traffic.

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

TuB2—Tuscola loam, loamy substratum, 1 to 6 percent slopes, eroded. This deep, nearly level and gently sloping, moderately well drained soil is on outwash plains. Areas are irregular in shape and are 2 to 40 acres in size.

Typically, the surface layer is yellowish brown loam about 11 inches thick. The subsoil is about 31 inches thick. The upper part is dark brown and yellowish brown, friable to firm clay loam. The next part is yellowish brown, mottled, firm sandy clay loam. The lower part is yellowish brown, firm silt loam. The substratum to a depth of 60 inches is yellowish brown, grayish brown, and light olive brown, friable fine sandy loam. In some areas the surface layer and subsoil are more sandy. In a few areas glacial till or gravelly coarse sandy loam is within a depth of 60 inches.

Included with this soil in mapping are the somewhat poorly drained Whitaker and very poorly drained Rensselaer soils in the lower positions on the landscape. Included soils make up 4 to 10 percent of the map unit.

Permeability is moderate in the Tuscola soil. The available water capacity is high. The organic matter content is moderately low in the surface layer. Runoff is rapid. The water table is at a depth of 2.0 to 3.5 feet from late in fall to early in spring. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. Practices that control erosion and runoff, such as including grasses and legumes in the cropping system, terraces, grassed waterways, and grade stabilization structures, are needed if cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to control erosion, maintain the organic matter content, and improve tilth. The soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa and red clover, for hay or pasture. The hazard of erosion is the main management concern. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the wetness and a shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. A foundation drainage system lowers the water table. Strengthening basement walls, foundations, and footings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the base material with a better suited material improves the ability of the roads and streets to support vehicular traffic. Providing roadside ditches and installing culverts minimize the damage caused by frost action.

Because of the wetness, this soil is severely limited as a site for septic tank absorption fields. Installing interceptor drains around the outer edges of the absorption field reduces the wetness.

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

Ud—Udorthents, loamy. These deep, nearly level, somewhat poorly drained soils are in areas that have been so disturbed that the original soils are not recognizable. Areas are irregular in shape and are 3 to 300 acres in size.

Typically, the original surface layer and most of the subsoil has been removed. The remaining soil material, which is dominantly clay loam and silty clay loam, has been smoothed by machinery.

Included with this unit in mapping are a few areas of soils that have not been disturbed and some areas that are covered by roads and other public facilities and buildings. Also included are some ponded areas and some areas used as landfills. Some of the ponded areas are as much as 10 to 12 feet deep. Included soils make up about 7 percent of this unit.

Permeability is moderately slow or very slow in the Udorthents. The available water capacity is moderate. Much of the original topsoil has been removed or destroyed, leaving a surface layer of dominantly parent material that is low in organic matter content. Runoff generally is very slow, but some areas are ponded.

Some areas are used as building sites or for grasses. Some are idle. A few are used for cultivated crops.

No land capability classification or woodland ordination symbol is assigned.

Wa—Wallkill silt loam, coprogenous earth substratum, drained. This deep, nearly level, very poorly drained soil is in deep depressions on till plains and flood plains. It is commonly ponded by runoff from adjacent higher areas. Areas are oval or irregularly shaped and are 3 to 10 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The substratum is dark grayish brown silt loam about 9 inches thick. The next layer is about 24 inches of highly decomposed organic material. The upper 4 inches is black, and the lower 20 inches is dark brown and brown. Below this to a depth of 60 inches is dark grayish brown coprogenous earth. In some places the overwash of mineral material is less than 16 inches thick. In other places the surface layer is silty clay loam. In some areas the organic material in the lower part of the profile is less decomposed. In other areas the lower part of the profile is clay loam or silty clay loam.

Included with this soil in mapping are small areas that are wet most of the year. Also included are the very poorly drained Milford and poorly drained Pella soils at the slightly higher elevations. Milford and Pella soils are not underlain by organic material. Included soils make up 4 to 12 percent of the map unit.

Permeability is moderate in the surface layer and substratum of the Wallkill soil, moderately rapid in the organic layer, and slow in the underlying coprogenous earth. The available water capacity is very high. The organic matter content is moderate in the surface layer. Runoff is very slow or ponded. The water table is at or above the surface from fall to spring. The surface layer is friable, and tilth is good.

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

If drained, this soil is fairly well suited to corn, soybeans, and small grain. The wetness is the main limitation. The ponding is the main hazard. The soil generally is difficult to drain, because adequate drainage outlets are not available in many areas. Clay or concrete tile drains installed in the organic layer often do not function properly within a few years because of the effects of subsidence. The instability of the organic layer causes ditchbanks to cave in and block the surface drains. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops reduce crusting, improve tilth, and increase the water infiltration rate.

This soil is well suited to grasses, such as reed canarygrass, for hay or pasture. The wetness and the ponding are the main management concerns. Adequate drainage is needed for maximum yields. The ponding can damage the legumes. Overgrazing or grazing when the soil is wet causes surface compaction. Pasture rotation, timely deferment of grazing, and restricted use during wet periods 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. Equipment should be operated only when the soil is relatively dry or frozen. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. Because of the ponding and frost action, the soil is severely limited as a site for local roads. Excavating the organic layer, constructing roads on raised, well compacted fill material, providing roadside ditches, and installing culverts minimize the damage caused by ponding and frost action.

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

Wd—Wallkill silt loam, undrained. This deep, nearly level, very poorly drained soil is in deep depressions on till plains and bottom land. It is ponded for prolonged periods by runoff from adjacent higher areas. Areas are oval or irregularly shaped and are 3 to 10 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The substratum is very dark grayish brown silt loam about 10 inches thick. The next layer is about 12 inches of black muck. Below this to a depth of 60 inches is highly decomposed, black and brown muck. In some areas the overwash of mineral material is less than 16 inches thick. In other areas the lower part of the profile is coprogenous material. In some places the lower part of the profile is clay loam or silty clay loam.

Included with this soil in mapping are the very poorly drained Milford and poorly drained Pella soils. These soils are at the slightly higher elevations. Milford and Pella soils are not underlain by organic material. Included soils make up 4 to 10 percent of the map unit.

Permeability is moderate in the surface layer and substratum of the Wallkill soil and moderately rapid in the underlying organic material. The available water capacity is very high. The organic matter content is high in the surface layer. Runoff is very slow or ponded. The water table is commonly at or above the surface from fall to spring. The surface layer is friable when dry.

Most areas are used as wildlife habitat. A few are used for pasture. This soil is generally unsuitable for cultivated crops because of the ponding.

This soil is poorly suited to grasses for pasture and generally is unsuitable for hay. The ponding and the wetness are the main management concerns. Drainage systems are difficult to establish. Grasses that are tolerant of wetness should be planted. Equipment bogs down during use. Livestock cause pitting of the surface.

This soil is poorly suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Planting special nursery stock and overstocking help to compensate for the seedling mortality rate. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

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

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

WsA—Whitaker silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on terraces. Areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is dark brown silt loam about 11 inches thick. The subsoil is about 30 inches thick. The upper part is yellowish brown, mottled, friable to firm silty clay loam, clay loam, and loam. The lower part is yellowish brown, mottled, friable loam. The substratum to a depth of 60 inches is yellowish brown, mottled loam and sandy loam that has thin strata of loamy sand. In some places the surface layer is darker. In other places the surface layer and subsoil are more clayey. In a few areas the soil is underlain by glacial till or gravelly outwash.

Included with this soil in mapping are the moderately well drained Tuscola soils in the higher positions on the landscape and the very poorly drained Rensselaer soils in depressions. Included soils make up about 10 percent of the map unit.

Permeability is moderate in the Whitaker soil. The available water capacity is high. The organic matter content is moderate in the surface layer. Runoff is slow. The water table is at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Subsurface and surface drains reduce wetness. A system of conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain the organic matter content and improve tilth. The soil is well suited to ridge-till farming.

This soil is well suited to grasses, such as bromegrass, and shallow-rooted legumes, such as ladino clover and red clover, for hay or pasture. The wetness is the main management concern. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. It can be controlled by proper site preparation and by cutting, spraying, or girdling unwanted trees and shrubs.

Because of the wetness, this soil is severely limited as a site for dwellings and septic tank absorption fields. A subsurface drainage system helps to lower the water table.

Because of frost action, this soil is severely limited as a site for local roads and streets. Replacing or covering the upper soil layers with suitable base material, providing roadside ditches, and installing culverts help to prevent the damage caused by frost action.

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

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 or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

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

About 225,798 acres in the survey area, or nearly 95 percent of the total acreage, meets the soil requirements for prime farmland. This land is evenly distributed throughout the county. About 187,000 acres of this prime farmland is used for crops. The main crops grown are corn, soybeans, and small grain.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, wet or 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 of each map unit 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 limitations, such as a high water table or frequent flooding during the growing season, qualify for prime farmland only in areas where these limitations have been overcome by such measures as drainage or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

John Robbins, district conservationist, Soil Conservation Service, helped to prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to the 1982 Census of Agriculture *(7)*, there was 204,009 acres of cropland and pasture in the survey area. Of this, about 184,874 acres was used for crops. The main crops grown in the area are corn and soybeans, but smaller acreages of wheat, oats, hay, and vegetables also are grown.

The potential is good for increased production of food on the soils in the survey area. Application of the latest technology on all of the cropland can increase the production significantly. The information in this survey can greatly facilitate the use of this technology.

The acreage of crops and pasture is very slowly decreasing as areas are being developed for urban uses. In 1967 an estimated 4,929 acres was used for urban and built-up land. The amount of this land is increasing at the rate of about 201 acres per year *(3)*. The information in the section "Broad Land Use Considerations" can be used to help make land use decisions that will influence the future of farming in this county.

Soil drainage is the main concern on most of the soils used for cropland and pasture. Artificial drainage is adequate for crops on most of the very poorly drained soils, such as Sloan, Pewamo, Milford, Millgrove, Millsdale, Rensselaer, and Saranac soils, and on the poorly drained Milford soils that have a stratified sandy substratum, the Pella soils that have a sandy substratum, and the Pella soils that have a till substratum. Drainage is not feasible, however, in a few areas of the very poorly drained soils, such as Wallkill soils, in depressions because of the deep ditches needed and the inavailability of suitable outlets. Unless artificially drained, the somewhat poorly drained Blount, Del Rey, Digby, Haskins Variant, Randolph, and Whitaker soils are so wet that damage to crops occurs in most years.

Armiesburg, Belmore Variant, Eldean, Eldean Variant, and Morley soils are naturally well drained, but they tend to dry out slowly after periods of rainfall. Small areas of wetter soils along drainageways and in swales are commonly included in mapping with the areas of these soils that have 2 to 6 percent slopes. Artificial drainage is needed in some of these areas.

The kinds of surface and subsurface drainage systems needed depend on the kinds of soil. A combination of surface and subsurface drains is needed in most areas of the poorly drained and very poorly drained soils that are intensively row cropped. Drains need to be more closely spaced in areas of soils that have slower permeability. Outlets for tile drains are inadequate in many areas of Milford, Millgrove, Millsdale, Pewamo, Pella, Rensselaer, and Wallkill soils.

Soil erosion is the main concern on about 29 percent of the cropland and pasture in the county. It is a hazard in areas that have slopes of more than 2 percent. Erosion can reduce productivity and increase sedimentation in streams.

Productivity is reduced as the surface layer is lost through erosion and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is a concern especially on soils that have a clayey subsoil, such as Blount, Del Rey, Glynwood, Morley, and Pewamo soils, and on soils that have a layer in or below the subsoil that limits root depth, such as Millsdale, Milton Variant, and Randolph soils. The root zone in these soils is limited by the depth to bedrock. Erosion also reduces the productivity of soils that tend to be droughty, such as Belmore Variant, Eldean, Eldean Variant, Haney, and Rawson Variant soils.

Erosion produces sediments that can enter streams. Controlling erosion reduces the risk of pollution of streams and helps to maintain the quality of water for municipal use, recreation areas, and fish and wildlife habitat.

On many sloping soils, preparation of a good seedbed and tillage are difficult because the original friable surface layer has been eroded. Poor tilth is common in areas of the severely eroded Glynwood and Morley soils.

A protective plant cover helps to control runoff and increases infiltration. A cropping system that keeps crop residue or a plant cover on the surface helps to keep soil losses to a minimum so that the productivity of the soil is maintained. On livestock farms, including legumes and grasses for forage in the cropping system reduces the risk of erosion in sloping areas, provides nitrogen, and improves tilth. Well drained soils, such as Armiesburg, Belmore Variant, Eldean, Eldean Variant, Milton Variant, and Morley soils, are well suited to bromegrass, orchardgrass, and timothy mixed with alfalfa or red clover. The poorly drained and very poorly drained soils, such as Milford, Millgrove, Millsdale, Pella, Pewamo, and Rensselaer soils, are well suited to reed canarygrass mixed with ladino clover or alsike clover.

Conservation tillage and keeping crop residue on the surface increase infiltration and help to control runoff and erosion. These practices are suited to most of the soils in the survey area. No-till or ridge-till farming of corn and soybeans is increasing. No-till farming helps to control erosion on sloping soils. Most of the soils in the area used for crops can be no-till farmed. The well drained soils are better suited to no-till farming, however, because they warm up quicker in spring than the wetter ones. The very poorly drained and poorly drained soils are better suited to ridge-till farming, because this method helps to speed up the warming of these soils in spring.

Terraces and water- and sediment-control basins shorten the effective length of slopes and thus reduce sheet, rill, and gully erosion. These measures are best suited to areas of the deep, well drained soils, such as Morley soils, that have slopes of less than 12 percent. Terraces and diversions are less suited to soils that are strongly sloping or that have bedrock within a depth of 40 inches. Contour farming and contour stripcropping help to control erosion. These practices are suited to all of the soils in the survey area, but they are best suited to those that have smooth, uniform slopes, such as Morley soils.

Grassed waterways are used throughout the area to control erosion. They are best suited to the deep, well drained soils, such as Morley soils. Grassed waterways also are needed in the large watersheds in areas of Blount, Del Rey, Glynwood, Milford, Millgrove, Millsdale, Pella, Pewamo, and Rensselaer soils. On all of these soils except Rensselaer soils, subsurface drainage generally is needed in the waterways.

Because of the large number of open ditches in the survey area, many grade stabilization structures are needed. These structures help to control erosion where runoff drains into the open ditches. They also commonly are needed in the open ditches that are subject to erosion because of the excessive slope.

Fertility is naturally low or moderate in most of the soils on uplands and terraces. Except for the Wallkill soils, these soils are slightly acid or neutral. The soils on flood plains, such as Armiesburg, Eel, Ross, Saranac, Shoals, and Sloan soils, are neutral or mildly alkaline. Natural fertility is higher in these soils than in most of the soils on uplands and terraces.

Acid soils require applications of ground limestone to raise the reaction to a level sufficient for good growth of alfalfa and other crops that grow best on nearly neutral soils. The levels of available phosphorus and potassium are naturally low in most areas of these acid soils. Additions of lime and fertilizer should be based on soil tests, the needs of the crop grown, and the expected yields. The Cooperative Extension Service can assist in determining the proper kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water. Soils that have good tilth are granular and porous.

Most of the soils used for crops have a light colored surface layer of silt loam. The organic matter content is low or moderate. Generally, these soils have weak structure. A crust forms on the surface after periods of heavy rainfall. The crust is hard when dry, which reduces the infiltration rate and increases the runoff rate. Regular additions of crop residue, manure, and other organic material can improve soil tilth and help to prevent crusting. A system of conservation tillage also is needed on these soils. If they are plowed in fall, a crust forms in winter and spring. About 30 percent of the cropland in this survey area consists of sloping soils that are subject to erosion if plowed in fall.

The dark colored Milford, Millsdale, Pewamo, and Saranac soils commonly stay wet until late in spring. If these soils are plowed when wet, they tend to become very cloddy when dry and a good seedbed is difficult to prepare. Plowing these soils in fall generally results in good tilth in spring.

Field crops suited to the soils and climate in this survey area include many that are not commonly grown. Corn and soybeans are the main row crops grown, and wheat and oats are the most commonly grown small grain crops. Rye and barley also can be grown. Bromegrass, orchardgrass, fescue, redtop, and bluegrass can be grown for grass seed.

Specialty crops are of limited commercial importance in the survey area. Only a small acreage is used for vegetables and small fruit. The deep soils that have good natural drainage and warm up early in spring are especially well suited to many vegetables and small fruit. Examples are the Belmore Variant, Eldean, and Eldean Variant soils that have slopes of less than 6 percent. These soils need to be irrigated for optimum production. Crops generally can be planted and harvested earlier on these soils than on the other soils in the area. If drained, the mucky soils in the survey area are well suited to a wide variety of vegetables. Most of the well drained soils are suitable for orchard crops and nursery plants. Soils in the lower landscape positions that are subject to frequent frosts and poor air drainage generally are poorly suited to early-maturing vegetables, small fruit, and orchard crops. The latest information and suggestions for 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. These levels are defined in the following paragraphs.

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 table 6.

Woodland Management and Productivity

Gary L. Maners, forester, Soil Conservation Service, helped to 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 expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public 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, biologist, Soil Conservation Service, helped to 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, sorghum, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are orchardgrass, timothy, bromegrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are goldenrod, beggarweed, ragweed, pokeweed, sheep sorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are maple, beech, oak, hickory, poplar, wild cherry, willow, black walnut, apple, hawthorn, dogwood, hazelnut, blackberry, elderberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn olive, silky dogwood, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and cedar.

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, cattail, waterplantain, arrowhead, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, dove, meadowlark, field sparrow, cottontail, red fox, and woodchuck.

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 blue jay, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

Not rated in the table is edge habitat, which consists of the areas where major land uses or cover types join. A good example is the border between dense woodland and a no-till farmed cornfield. Edge habitat is very important to many animals, from the smallest songbirds to white-tailed deer. Most of the openland and woodland wildlife frequently use this habitat. Desirable areas of edge habitat consistently are used by many times more wildlife species than the center of large areas of woodland or cropland.

Engineering

Max L. Evans, state conservation engineer, Soil Conservation Service, helped to 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, 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 to a very firm and 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 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 or ponding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a very firm and dense layer, large stones, slope, and flooding or ponding 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 or ponding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a very firm and dense layer, and the available water capacity in the upper 40 inches affect plant growth. Flooding or ponding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface drains 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 or ponding affect absorption of the effluent. Large stones and bedrock 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 or ponding, 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 or ponded water 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, a high water table, slope, and flooding or ponding 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 to 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 a suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have 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 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, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table 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 very firm 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 in. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a very firm and dense layer affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind 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 wind erosion, 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.

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. 9). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

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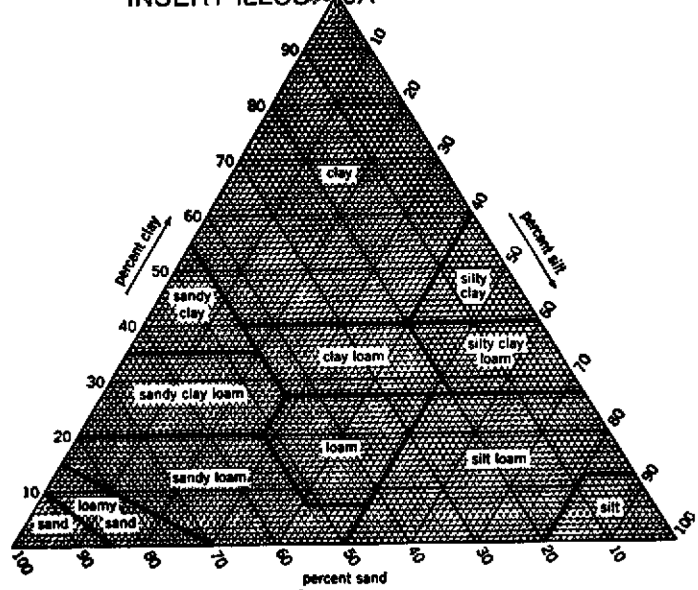

Figure 9.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

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 wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. 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 wind erosion 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 wind erosion 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 wind erosion 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 wind erosion 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 wind erosion 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 wind erosion 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 wind erosion are used.

8. Soils that are not subject to wind erosion 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; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by Robert Rahn, soils laboratory supervisor, Indiana Department of Highways.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(6)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 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 Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. 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-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (5)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (6)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Armiesburg Series

The Armiesburg series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

The Armiesburg soils in this county contain slightly more sand in the control section than is defined as the range for the series. This difference, however, does not affect the use or management of the soils.

Armiesburg soils are commonly adjacent to Saranac soils. Saranac soils are grayer and more clayey throughout the solum than the Armiesburg soils. Also, they are lower on the landscape.

Typical pedon of Armiesburg silty clay loam, frequently flooded, in a cultivated field; 280 feet south and 2,590 feet west of the northeast corner of sec. 29, T. 27 N., R. 12 E.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium and coarse granular structure; friable; few fine roots; few fine pores; slightly acid; abrupt smooth boundary.

AB—12 to 20 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; firm; few fine roots; few fine pores; neutral; clear smooth boundary.

Bw1—20 to 32 inches; dark brown (10YR 4/3) clay loam; weak coarse prismatic structure parting to weak and moderate medium subangular blocky; firm; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine roots; few fine pores; neutral; diffuse smooth boundary.

Bw2—32 to 40 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; few fine pores; thin discontinuous dark yellowish brown (10YR 3/4) organic coatings on faces of peds; neutral; diffuse wavy boundary.

Bw3—40 to 50 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine pores; thin dark yellowish brown (10YR 3/4) silt coatings on faces of peds; thin very dark grayish brown (10YR 3/2) organic stains in old roots channels; neutral; diffuse smooth boundary.

C—50 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/8) mottles; weak very coarse prismatic structure; few fine roots; thin very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 3/4) organic coatings on vertical cleavage planes; firm; neutral.

The solum is 45 to 50 inches thick. The Ap or A horizon has chroma of 2 or 3. It is dominantly silty clay loam, but in some pedons it is silt loam. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

Belmore Variant

The Belmore Variant consists of deep, well drained soils on low stream terraces. These soils formed in loamy outwash underlain by gravelly sand or gravelly loamy sand. They are moderately rapidly permeable in the subsoil and rapidly permeable in the substratum. Slopes range from 0 to 2 percent.

Belmore Variant soils are similar to Ross soils and are commonly adjacent to Digby, Eldean Variant, Haney, and Millgrove soils, which are on the higher parts of the landscape. Ross soils have a mollic epipedon that is thicker than that of the Belmore Variant soils. They are on flood plains. Digby soils have grayish brown mottles in the upper part of the subsoil. Eldean Variant soils are more clayey in the solum than the Belmore Variant soils and have a browner surface layer. Haney soils have mottles in the lower part of the subsoil. Millgrove soils are grayer throughout the solum than the Belmore Variant soils.

Typical pedon of Belmore Variant loam, 0 to 2 percent slopes, frequently flooded, in a cultivated field; 1,850 feet west and 2,300 feet south of the northeast corner of sec. 29, T. 27 N., R. 12 E.

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; few fine roots; few fine pores; medium acid; abrupt smooth boundary.

AB—9 to 13 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; few fine roots; few fine pores; medium acid; clear smooth boundary.

Bt1—13 to 22 inches; dark brown (7.5YR 3/4) loam; moderate medium subangular blocky structure; firm; few fine roots; many fine pores; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear wavy boundary.

Bt2—22 to 27 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; few fine roots; many medium and fine pores; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—27 to 38 inches; brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; few fine roots; many fine pores; thin continous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 1 percent gravel; strongly acid; clear wavy boundary.

Bt4—38 to 47 inches; brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin patchy dark yellowish brown

(10YR 3/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt5—47 to 57 inches; brown (7.5YR 4/4) sandy loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; neutral; clear wavy boundary.

BCt—57 to 65 inches; dark yellowish brown (10YR 4/4) fine sandy loam; common fine distinct yellowish brown (10YR 5/6) and few fine faint brown (10YR 5/3) mottles; massive; friable; thin patchy dark brown (7.5YR 3/4) clay films on faces of peds; about 3 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

C—65 to 72 inches; yellowish brown (10YR 5/4) very gravelly sandy loam that has thin strata of loamy coarse sand; single grain and massive; loose and friable; about 40 percent gravel; strong effervescence; moderately alkaline.

The solum is 60 to 72 inches thick. The content of gravel ranges from 0 to 5 percent in the upper part of the solum and from 0 to 10 percent in the lower part.

The Ap or A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 to 4. The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 3 or 4. The BC horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6.

Blount Series

The Blount series consists of deep, somewhat poorly drained, slowly permeable soils on till plains and moraines. These soils formed in glacial till. Slopes range from 0 to 4 percent.

Blount soils are similar to Randolph soils and commonly are adjacent to Del Rey, Glynwood, Morley, and Pewamo soils. Randolph soils formed in glacial till and are underlain by limestone at a depth of 20 to 40 inches. Del Rey soils are stratified in the substratum. They are in landscape positions similar to those of the Blount soils. Glynwood soils are moderately well drained and are in the higher landscape positions. Morley soils are well drained and are on knolls and side slopes. Pewamo soils have a surface layer that is darker than that of the Blount soils. They are in depressions.

Typical pedon of Blount silt loam, in a cultivated area of Del Rey-Blount silt loams, 0 to 1 percent slopes; 75 feet north and 1,480 feet east of the southwest corner of sec. 3, T. 28 N., R. 11 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 12 inches; brown (10YR 5/3) clay; common fine faint grayish brown (10YR 5/2) and few fine prominent yellowish brown (10YR 5/8) mottles; weak thin platy structure; firm; common fine and very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear wavy boundary.

Bt2—12 to 17 inches; yellowish brown (10YR 5/4) clay; common fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films and thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

BCt—17 to 23 inches; yellowish brown (10YR 5/6) clay loam; weak thick platy structure; very firm; few very fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thick discontinuous very dark grayish brown (10YR 3/2) organic-stained clay flows between peds; black (10YR 2/1) accumulations of iron and manganese oxide; about 3 percent gravel; strong effervescence; mildly alkaline; clear wavy boundary.

C1—23 to 30 inches; yellowish brown (10YR 5/4) clay loam; weak very thick platy structure; very firm; few very fine roots; thin patchy very dark grayish brown (10YR 3/2) organic-stained clay films on faces of peds; thin discontinuous white (10YR 8/1) coatings of carbonate between peds; about 3 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

C2—30 to 60 inches; yellowish brown (10YR 5/4) clay loam; weak very thick platy structure; very firm; few very fine roots concentrated along faces of peds and in vertical channels; thin patchy dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films concentrated in vertical channels; thin discontinuous white (10YR 8/1) coatings of carbonate on faces of peds; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 22 to 45 inches thick. The Ap horizon has chroma of 1 to 3. It is dominantly silt loam, but the range includes loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is very strongly acid to slightly acid in the upper part and slightly acid to mildly alkaline in the lower part. The BC horizon has colors similar to those of the Bt horizon. It is clay loam or silty clay loam. The C horizon also is clay loam or silty clay loam.

Coesse Series

The Coesse series consists of deep, very poorly drained, moderately slowly permeable soils on till plains. These soils formed in recent alluvium over silty or clayey lacustrine deposits. Slopes range from 0 to 2 percent.

Coesse soils are similar to Saranac soils and are commonly adjacent to Milford, Morley, and Pewamo soils. Saranac soils have a surface layer that is darker than that of the Coesse soils and have more clay in the upper part of the solum. Milford and Pewamo soils are grayer in the solum than the Coesse soils. They are in the higher landscape positions. Morley soils are well drained and are on side slopes along the major streams.

Typical pedon of Coesse silt loam, in a cultivated field; 2,400 feet south and 2,200 feet west of the northeast corner of sec. 13, T. 25 N., R. 10 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Cg1—7 to 14 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; few fine faint gray (10YR 5/1) mottles; massive; firm; many fine roots; neutral; clear wavy boundary.

Cg2—14 to 22 inches; dark grayish brown (10YR 4/2) silt loam; many medium faint gray (10YR 5/1) and few medium distinct yellowish brown (10YR 5/4) mottles; massive; firm; few fine roots; neutral; clear wavy boundary.

2Ab—22 to 32 inches; very dark gray (10YR 3/1) silty clay; weak coarse prismatic structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) coatings of silt on faces of peds; neutral; clear wavy boundary.

2Btgb1—32 to 45 inches; dark gray (10YR 4/1) silty clay; common medium prominent yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; thin discontinuous light brownish gray (10YR 6/2) coatings of silt on faces of peds; thin continuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

2Btgb2—45 to 49 inches; dark gray (10YR 4/1) clay; common fine prominent light olive brown (2.5Y 5/6) and few fine faint gray (10YR 5/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous light brownish gray (10YR 6/2) coatings of silt on faces of peds; fine patchy dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

2BCg—49 to 57 inches; gray (10YR 5/1) clay loam; common coarse prominent olive yellow (2.5Y 6/8) and olive (5Y 5/4) mottles; weak coarse prismatic structure; firm; few fine roots; thin patchy dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

2Cg—57 to 65 inches; gray (10YR 5/1) silty clay loam; common medium prominent olive yellow (5Y 6/8) and few fine faint dark gray (10YR 4/1) mottles; massive; firm; slight effervescence; mildly alkaline.

The alluvial deposits are 20 to 40 inches deep over the buried soil. The buried soil has a solum that is 35 to 60 inches thick. The alluvium and buried soil are slightly acid to moderately alkaline.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The Cg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. The 2Ab horizon has hue of 10YR, value of 3, and chroma of 1 or 2. The 2Btgb horizon has hue of 10YR, value of 4 or 5, and chroma of 1.

Del Rey Series

The Del Rey series consists of deep, somewhat poorly drained, slowly permeable soils on till plains and moraines. These soils formed in silty lacustrine sediments. Slopes range from 0 to 4 percent.

Del Rey soils are similar to Randolph soils and are commonly adjacent to Blount, Milford, Pella, and Pewamo soils. Randolph soils formed in glacial till over limestone. Blount soils formed in glacial till. Milford, Pella, and Pewamo soils have a darker surface layer and are grayer throughout the solum than the Del Rey soils. They are in depressions.

Typical pedon of Del Rey silt loam, in a cultivated area of Del Rey-Blount silt loams, 0 to 1 percent slopes; 1,560 feet north and 440 feet east of the southwest corner of sec. 3, T. 27 N., R. 12 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 13 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; weak medium prismatic structure parting to moderate fine angular blocky; firm; common fine and very fine roots; thin continuous dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—13 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; common fine and very fine roots; thin continuous dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

Bt3—20 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

Bt4—29 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse angular blocky; firm; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films concentrated in vertical channels; thin patchy white (10YR 8/1) coatings of carbonate on faces of peds; about 1 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

C1—37 to 49 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; firm; few very fine roots; medium patchy very dark grayish brown (10YR 3/2) organic-stained clay flows concentrated in vertical channels; about 2 percent gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—49 to 60 inches; yellowish brown (10YR 5/4), stratified silty clay loam and silt loam; many medium distinct yellowish brown (10YR 5/6) and common fine distinct dark grayish brown (10YR 4/2) mottles; weak thick platy structure; very firm; few very fine roots; thin patchy white (10YR 8/1) coatings of carbonate on faces of peds and in vertical channels; about 2 percent gravel; strong effervescence; moderately alkaline.

The solum is 28 to 48 inches thick. The depth to carbonates is 18 to 55 inches.

The Ap horizon has chroma of 2 or 3. The Bt horizon has value of 4 to 6 and chroma of 3 to 6. It is dominantly silty clay loam, but it has thin layers of silty clay or clay. It is slightly acid or neutral in the upper part and neutral or mildly alkaline in the lower part. The C horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly silty clay loam, but in some pedons it has strata of clay loam, silt loam, or silty clay.

Digby Series

The Digby series consists of deep, somewhat poorly drained soils on broad stream terraces. These soils formed in loamy and silty sediments underlain by gravelly loamy sediments. They are moderately permeable in the subsoil and rapidly permeable in the substratum. Slopes range from 0 to 2 percent.

The Digby soils in this county have a higher content of clay in the control section and have a thicker silty mantle than is defined as the range for the series. This difference, however, does not affect the use or management of the soils.

Digby soils are similar to Haskins Variant and Whitaker soils and are adjacent to Belmore Variant, Eldean Variant, Haney, and Millgrove soils. Haskins Variant soils formed in loamy outwash over glacial till. Whitaker soils have less gravel in the lower part of the solum and in the substratum than the Digby soils. Belmore Variant, Eldean Variant, and Haney soils are browner throughout the solum than the Digby soils and are on the slightly higher rises. Millgrove soils are grayer throughout the solum than the Digby soils and are lower on the landscape.

Typical pedon of Digby silt loam, 0 to 2 percent slopes, in a cultivated field; 75 feet north and 1,300 feet east of the southwest corner of sec. 20, T. 27 N., R. 11 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; few fine and very fine roots; few fine pores; neutral; abrupt smooth boundary.

Bt1—10 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; many fine and very fine roots; few medium pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin continuous brown (10YR 4/3) coatings of silt on faces of peds; slightly acid; clear smooth boundary.

2Bt2—19 to 28 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many fine and very fine roots; common fine pores; thin continuous grayish brown (10YR 5/2) and thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds; few black (10YR 2/1) organic stains on faces of peds; neutral; clear smooth boundary.

2Bt3—28 to 46 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; common fine pores; thin continuous dark brown (10YR 4/3) clay films on faces of peds; about 5 percent gravel; slight effervescence; mildly alkaline; clear smooth boundary.

3Bt4—46 to 58 inches; yellowish brown (10YR 5/4) gravelly loam; common medium distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy dark brown (10YR 4/3) clay films on faces of peds; about 20 percent gravel; strong effervescence; mildly alkaline; clear smooth boundary.

3C—58 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sandy loam that has thin strata of loamy coarse sand; massive; friable; about 50 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 65 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 4 to 6 and chroma of 3 to 6. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is dominantly clay loam, but the range includes sandy clay loam or loam. The 3Bt horizon has hue of 10YR or 5Y, value of 4 or 5, and chroma 2 to 4. The C horizon is mildly alkaline or moderately alkaline.

Eel Series

The Eel series consists of deep, moderately well drained, moderately permeable soils on bottom land. These soils formed in alluvium. Slope ranges from 0 to 2 percent.

The Eel soils are adjacent to Ross, Shoals, and Sloan soils. Ross soils have a darker surface layer than that of the Eel soils. They are on the slightly higher rises. Shoals and Sloan soils are mottled in the upper part of the subsoil. They are in the slightly lower areas on the landscape.

Typical pedon of Eel silt loam, frequently flooded, in a cultivated field; 800 feet north and 300 feet west of the southeast corner of sec. 5, T. 28 N., R. 11 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; few fine roots; few fine pores; neutral; abrupt smooth boundary.

Bw1—9 to 13 inches; dark brown (10YR 4/3) silt loam; weak coarse subangular blocky structure; friable; few fine roots; few fine pores; neutral; clear wavy boundary.

Bw2—13 to 19 inches; dark brown (10YR 4/3) silt loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; friable; few fine roots; many fine pores; thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; neutral; clear wavy boundary.

Bw3—19 to 23 inches; brown (10YR 4/3) silt loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; friable; few fine roots; many fine pores; thin discontinuous dark grayish brown (10YR 4/2) coatings of silt on faces of peds; neutral; clear wavy boundary.

Bw4—23 to 30 inches; brown (10YR 4/3) loam; few fine faint dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine and medium pores; thin patchy dark grayish brown (10YR 4/2) organic coatings on faces of peds; neutral; clear wavy boundary.

C1—30 to 38 inches; grayish brown (10YR 5/2) loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; thin patchy black (10YR 2/1) accumulations of iron and manganese oxide; neutral; abrupt wavy boundary.

C2—38 to 47 inches; dark grayish brown (10YR 4/2) sandy loam; many fine distinct yellowish brown (10YR 5/6) mottles; massive; very friable; about 4 percent fine gravel; neutral; abrupt wavy boundary.

C3—47 to 54 inches; light brownish gray (10YR 6/2) sandy loam; common fine distinct yellowish brown (10YR 5/6) mottles; very friable; about 6 percent fine gravel; neutral; abrupt wavy boundary.

C4—54 to 60 inches; grayish brown (10YR 5/2) sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; very friable; about 14 percent gravel; neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A horizon, if it occurs, is silt loam or loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. It is loam or silt loam in the upper part and loam or sandy loam in the lower part. It is slightly acid to mildly alkaline in the upper part and slightly acid to moderately alkaline in the lower part.

Eldean Series

The Eldean series consists of well drained soils on stream terraces. These soils are moderately deep over sand and gravelly sand. They formed in clayey, loamy, and gravelly outwash. They are moderately permeable or moderately slowly permeable in the subsoil and rapidly permeable in the substratum. Slopes range from 0 to 12 percent.

Eldean soils are adjacent to Glynwood Variant, Morley, Ross, and Sloan soils. Glynwood Variant and Morley soils formed in glacial till. They are on the higher till plains. Ross and Sloan soils are on the lower bottom land.

Typical pedon of Eldean loam, 2 to 6 percent slopes, eroded, in a cultivated field; 100 feet east and 1,460 feet north of the southwest corner of sec. 33, T. 25 N., R. 11 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many fine roots; many very fine pores; about 1 percent fine gravel; slightly acid; abrupt smooth boundary.

Bt1—8 to 13 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; many fine and medium pores; thin patchy brown (7.5YR 5/4) clay films on faces of peds; about 2 percent fine gravel; slightly acid; clear smooth boundary.

Bt2—13 to 20 inches; brown (7.5YR 4/4) clay; moderate medium subangular blocky structure; firm; common fine roots; few medium pores; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent fine gravel; slightly acid; clear wavy boundary.

2Bt3—20 to 25 inches; brown (7.5YR 4/4) gravelly clay; moderate medium subangular blocky structure; firm; few fine roots; few medium pores; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; thin discontinuous dark reddish brown (5YR 2.5/2) organic coatings on faces of peds; about 20 percent coarse gravel; medium acid; clear wavy boundary.

2Bt4—25 to 32 inches; brown (7.5YR 5/4) sandy clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; few medium pores; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent gravel; neutral; clear wavy boundary.

3Bt5—32 to 38 inches; dark brown (7.5YR 3/4) very gravelly sandy clay loam; weak medium subangular blocky structure; friable; thin patchy dark reddish brown (5YR 3/2) clay films on faces of peds; about 45 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

3C—38 to 60 inches; yellowish brown (10YR 5/4), stratified coarse sand and extremely gravelly coarse sand; single grain; loose; about 65 percent gravel; strong effervescence; moderately 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 or 3. It is dominantly loam, but ranges to gravelly clay loam in severely eroded areas. 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 or sandy clay loam. The 2Bt and 3Bt horizons have colors similar to those of the Bt horizon. They are dominantly gravelly or very gravelly clay loam, clay, or sandy clay loam, but thin nongravelly layers are in some pedons.

Eldean Variant

The Eldean Variant consists of well drained soils on stream terraces. The soils are moderately deep over gravelly sand and loamy sand. They formed in loamy, sandy, and gravelly outwash. They are moderately slowly permeable in the subsoil and rapidly permeable in the substratum. Slopes range from 2 to 6 percent.

Eldean Variant soils are adjacent to Belmore Variant, Digby, and Millgrove soils. Belmore Variant soils have more sand in the solum than the Eldean Variant soils. They are on the lower stream terraces. Digby soils have grayish brown mottles in the upper part of the subsoil and are in the less sloping areas on the landscape. Millgrove soils are grayer throughout the solum than the Eldean Variant soils. They are in the lower depressions.

Typical pedon of Eldean Variant silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,650 feet east and 1,190 feet north of the southwest corner of sec. 20, T. 27 N., R. 11 E.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many fine and very fine roots; few fine pores; slightly acid; abrupt smooth boundary.

AB—5 to 10 inches; dark brown (10YR 4/3) silt loam that has small chunks of dark yellowish brown (10YR 4/4) clay loam; weak medium subangular blocky structure; friable; many fine and very fine roots; few fine pores; slightly acid; abrupt smooth boundary.

Bt1—10 to 15 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine and very fine roots; many fine pores; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 7 percent gravel; neutral; clear wavy boundary.

Bt2—15 to 21 inches; dark yellowish brown (10YR 4/4) clay; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; many fine roots; many medium and fine pores; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 11 percent gravel; neutral; clear wavy boundary.

2Bt3—21 to 30 inches; dark yellowish brown (10YR 4/4) gravelly clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; common fine roots; many fine pores; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds; about 25 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2C1—30 to 40 inches; dark yellowish brown (10YR 4/4) very gravelly coarse sandy loam; massive; loose; about 55 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

2C2—40 to 60 inches; dark yellowish brown (10YR 4/4), stratified gravelly sandy loam and loamy coarse sand; massive; loose; about 34 percent gravel; strong effervescence; moderately alkaline.

The solum is 22 to 40 inches thick. The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The A horizon, if it occurs, is 2 to 4 inches thick. It is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) loam or silt loam. The Bt and 2Bt horizons have hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 or 4. The Bt horizon is clay loam, sandy clay loam, or clay. The 2Bt horizon is gravelly or very gravelly clay loam or sandy clay loam. The 2C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6.

Glynwood Series

The Glynwood series consists of deep, moderately well drained, slowly permeable soils on till plains and moraines. These soils formed in glacial till. Slopes range from 2 to 6 percent.

Glynwood soils are commonly adjacent to Blount, Morley, Pewamo, and Rawson Variant soils. Blount soils are grayer in the upper part of the solum than the Glynwood soils and are lower on the landscape. Morley soils are well drained and are in the more sloping areas. Pewamo soils have a darker surface layer than the Glynwood soils and are grayer throughout the solum. They are in the lower depressions. Rawson Variant soils are well drained and have more sand in the surface layer and subsoil than the Glynwood soils.

Typical pedon of Glynwood silt loam, 2 to 5 percent slopes, eroded, in a cultivated field; 2,475 feet south and 1,300 feet west of the northeast corner of sec. 21, T. 28 N., R. 12 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; firm; common fine and very fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; thin patchy very dark grayish brown (10YR 3/2) organic stains and clay films in old root channels; neutral; clear wavy boundary.

Bt2—11 to 16 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bt3—16 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; few very fine roots; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; clear wavy boundary.

C—22 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; weak very thick platy structure; very firm; few very fine roots; thin patchy grayish brown (10YR 5/2) clay films in vertical channels; thin patchy white (10YR 8/1) coatings of carbonate on faces of peds; strong effervescence; moderately alkaline.

The solum is 18 to 40 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly silt loam, but the range includes clay loam and silty clay loam in severely eroded areas. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly clay, clay loam, or silty clay. It is medium acid to neutral in the upper part and neutral or mildly alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Glynwood Variant

The Glynwood Variant consists of deep, moderately well drained, moderately slowly permeable soils in terracelike areas on till plains. These soils formed in glacial till. Slopes range from 0 to 2 percent.

Glynwood Variant soils are commonly adjacent to Eldean and Morley soils. Eldean soils have more sand in the subsoil than the Glynwood Variant soils and are underlain by stratified gravelly coarse sand and sand. They are in the slightly lower landscape positions. Morley soils are well drained and are in the higher areas on the landscape.

Typical pedon of Glynwood Variant silt loam, 0 to 2 percent slopes, in a cultivated field; 800 feet east and 1,700 feet south of the northwest corner of sec. 8, T. 27 N., R. 11 E.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and common very fine roots; slightly acid; abrupt smooth boundary.

Bt1—10 to 16 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—16 to 21 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; medium acid; clear wavy boundary.

Bt3—21 to 29 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; few very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; medium acid; clear wavy boundary.

Bt4—29 to 36 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bt5—36 to 48 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure; firm; thin patchy brown (10YR 4/3) clay films on faces of peds; thin discontinuous white (10YR 8/1) coatings of carbonate on faces of peds; about 5 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

C—48 to 60 inches; yellowish brown (10YR 5/4) clay loam; weak very thick platy structure; firm; thin continuous white (10YR 8/1) coatings of carbonate on faces of peds; strong effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has chroma of 2 or 3. It is loam or silt loam. The Bt horizon has chroma of 3 to 6. It is clay loam, silty clay loam, clay, or silty clay. It is medium acid to neutral in the upper part and medium acid to mildly alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Haney Series

The Haney series consists of deep, moderately well drained soils on stream terraces. These soils formed in silty, loamy, and gravelly outwash. They are moderately permeable in the subsoil and rapidly permeable in the substratum. Slopes range from 0 to 2 percent.

The Haney soils in this county do not have mottles in the upper 10 inches of the argillic horizon and the thickness of the solum and depth to carbonates are greater than are defined as the range for the series. These differences, however, do not affect the use or management of the soils.

Haney soils are similar to Tuscola soils and are commonly adjacent to Belmore Variant, Digby, Eldean Variant, Millgrove, and Rawson Variant soils. Tuscola soils have more clay and less sand and gravel than the Haney soils. Belmore Variant soils have a darker surface layer than the Haney soils and do not have mottles in the subsoil. They are in the slightly higher landscape positions. Digby and Millgrove soils are grayer throughout the solum than the Haney soils and are in the lower landscape positions. Eldean Variant soils are browner throughout than the Haney soils and are in the slightly higher landscape positions. Rawson Variant soils have more sand in the solum and more clay in the substratum than the Haney soils. They are in the slightly higher landscape positions.

Typical pedon of Haney silt loam, 0 to 2 percent slopes, in a cultivated field; 800 feet north and 1,860 feet west of the southeast corner of Reserve No. 38, T. 28 N., R. 11 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 15 inches; brown (7.5YR 5/4) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; medium acid; clear wavy boundary.

Bt2—15 to 25 inches; brown (7.5YR 5/4) sandy clay loam; weak medium subangular blocky structure;

firm; few fine roots; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds; thin patchy light brownish gray (10YR 6/2) coatings of silt on faces of peds; about 4 percent gravel; strongly acid; clear wavy boundary.

Bt3—25 to 32 inches; brown (7.5YR 5/4) sandy clay loam; few fine prominent grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 3/2) and brown (7.5YR 5/4) clay films on faces of peds; about 12 percent gravel; strongly acid; clear wavy boundary.

2Bt4—32 to 44 inches; brown (7.5YR 4/4) very gravelly clay loam; few fine distinct dark brown (7.5YR 4/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; friable; few fine and very fine roots; thin discontinuous dark brown (7.5YR 3/2) and brown (7.5YR 4/2) clay films on faces of peds; about 37 percent gravel; slightly acid; clear wavy boundary.

2Bt5—44 to 50 inches; brown (7.5YR 5/4) very gravelly sandy clay loam; common fine distinct brown (7.5YR 5/2) and common fine prominent yellowish red (5YR 5/8) mottles; few fine roots; weak medium angular blocky structure; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; massive; about 48 percent gravel; neutral; clear wavy boundary.

2BC—50 to 65 inches; brown (7.5YR 4/4) extremely gravelly coarse sandy loam; common fine distinct dark brown (7.5YR 4/2) and strong brown (7.5YR 4/6) mottles; massive; friable; about 75 percent gravel; mildly alkaline; clear wavy boundary.

2C—65 to 80 inches; yellowish brown (10YR 5/4), stratified gravelly coarse sandy loam and gravelly loamy coarse sand; common fine distinct dark grayish brown (10YR 4/2) mottles; massive; friable; about 28 percent gravel; slight effervescence; moderately alkaline.

The solum is 36 to 65 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly loam or silt loam, but the range includes sandy loam and fine sandy loam. The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. It is silt loam, sandy clay loam, or silty clay loam. It is very strongly acid to neutral. The 2Bt4 horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 3 to 6. It is sandy clay loam or clay loam. The 2Bt5 and 2BC horizons have hue of 7.5YR, value of 3 to 5, and chroma of 3 or 4. They are gravelly to extremely gravelly sandy clay loam or sandy loam. The 2C horizon is dominantly loam, coarse sandy loam, or the gravelly analogs of those textures, but it has strata of coarser textured material.

Haskins Variant

The Haskins Variant consists of deep, somewhat poorly drained soils on till plains and moraines. These soils formed in loamy and silty material underlain by glacial till. They are moderately permeable in the solum and slowly permeable in the substratum. Slopes range from 0 to 2 percent.

Haskins Variant soils are similar to Digby and Whitaker soils and commonly are adjacent to Glynwood, Pewamo, and Rawson Variant soils. Digby and Whitaker soils do not have glacial till within a depth of 60 inches. Glynwood soils are moderately well drained and have more clay in the subsoil than the Haskins Variant soils. They are in the slightly higher landscape positions. Pewamo soils are dominantly gray throughout and are in depressions. Rawson Variant soils are moderately well drained and are in the higher landscape positions.

Typical pedon of Haskins Variant loam, 0 to 2 percent slopes, in a cultivated field; 330 feet west and 1,780 feet south of the northeast corner of sec. 23, T. 28 N., R. 11 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

E—8 to 13 inches; brown (10YR 5/3) loam; moderate medium platy structure; friable; medium acid; abrupt smooth boundary.

Bt1—13 to 17 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct dark yellowish brown (10YR 4/6) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 3/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—17 to 24 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct dark yellowish brown (10YR 4/6) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 3/4) clay films on faces of peds; common black (10YR 2/1) organic stains on faces of peds; strongly acid; clear wavy boundary.

Bt3—24 to 33 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin patchy dark yellowish brown (10YR 3/4) and thin discontinuous gray (10YR 5/1) clay films on faces of peds; common black (10YR 2/1) organic stains on faces of peds; strongly acid; clear wavy boundary.

Bt4—33 to 37 inches; dark yellowish brown (10YR 4/4) sandy clay loam; common medium distinct grayish brown (10YR 5/2) and common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin patchy gray (10YR 5/1) clay films on faces of peds; common black (10YR 2/1) organic stains on faces of peds; neutral; clear wavy boundary.

2C—37 to 60 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct gray (10YR 5/1) mottles; massive; very firm; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The Ap horizon has chroma of 2 or 3. It is loam, fine sandy loam, or sandy loam. The Bt horizon is dominantly clay loam or sandy clay loam, but thin layers of loam or sandy loam are in some pedons. It is neutral to very strongly acid. The 2B horizon, if it occurs, is clay loam, silty clay loam, or silty clay. It is neutral or mildly alkaline. The 2C horizon is clay loam or silty clay loam.

Milford Series

The Milford series consists of deep, poorly drained and very poorly drained, moderately slowly permeable soils in depressions on till plains. These soils formed in silty or clayey lacustrine deposits. Slopes range from 0 to 2 percent.

Milford soils are similar to Millsdale, Pella, and Pewamo soils and commonly are adjacent to Del Rey and Wallkill soils. Millsdale soils formed in glacial till underlain by limestone. Pella soils have less clay and more silt in the solum and substratum than the Milford soils. Pewamo soils are underlain by glacial till. Del Rey soils are browner in the solum than the Milford soils. They are in the slightly higher landscape positions. Wallkill soils developed in silty or loamy material over organic deposits. They are in potholes.

Typical pedon of Milford silty clay loam, in a cultivated field; 270 feet west and 1,400 feet north of the southeast corner of sec. 17, T. 25 N., R. 13 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A—11 to 15 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; common fine roots; slightly acid; clear wavy boundary.

Bg1—15 to 22 inches; dark gray (10YR 4/1) clay loam; few fine prominent olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin patchy gray (10YR 5/1) clay films on faces of peds; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear wavy boundary.

Bg2—22 to 30 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct dark brown (10YR 4/3) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear wavy boundary.

Bg3—30 to 41 inches; grayish brown (10YR 5/2) silty clay; many coarse distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; continuous dark gray (10YR 4/1) organic coatings on faces of peds; neutral; clear wavy boundary.

Bg4—41 to 49 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bg5—49 to 57 inches; grayish brown (10YR 5/2) clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; about 1 percent gravel; mildly alkaline; clear wavy boundary.

Cg—57 to 65 inches; grayish brown (10YR 5/2) clay loam that has thin strata of sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; firm; about 3 percent gravel; strong effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, clay loam, or silty clay. The Cg horizon is dominantly clay loam or silty clay loam, but in many pedons it has thin strata of sandy loam or silty clay.

Millgrove Series

The Millgrove series consists of deep, very poorly drained soils on stream terraces. These soils formed in loamy outwash over stratified gravelly loamy and sandy material. They are moderately permeable in the subsoil and moderately rapidly permeable in the substratum. Slopes range from 0 to 2 percent.

The Millgrove soils in this county do not have an argillic horizon, which is defined as a characteristic of the series, because of an insufficient clay increase. This difference, however, does not affect the use or management of the soils.

Millgrove soils are similar to Rensselaer soils and are commonly adjacent to Belmore Variant, Digby, Eldean Variant, and Haney soils. Rensselaer soils have more stratified silty and loamy material in the substratum than the Millgrove soils. Belmore Variant, Digby, Eldean Variant, and Haney soils have a browner solum than the Millgrove soils and are in the higher landscape positions.

Typical pedon of Millgrove clay loam, in a hayfield; 1,320 feet west and 1,050 feet south of the northeast corner of sec. 33, T. 27 N., R. 12 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; few medium and many fine roots; medium acid; abrupt smooth boundary.

AB—8 to 14 inches; very dark gray (10YR 3/1) clay loam, gray (10YR 5/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium angular blocky; firm; many fine and few medium roots; many medium and few fine pores; about 1 percent gravel; slightly acid; clear wavy boundary.

BA—14 to 22 inches; dark gray (10YR 4/1) clay loam, gray (10YR 5/1) dry; common fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; many medium and fine pores; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

Btg1—22 to 33 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/4 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few fine pores; thin patchy dark grayish brown (10YR 4/2) and thin continuous gray (10YR 5/1) clay films on faces of peds; thin continuous black (10YR 2/1) and very dark grayish brown (10YR 3/2) organic stains on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

Btg2—33 to 37 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct dark grayish brown (10YR 4/2) and gray (10YR 5/1) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; few yellowish red (5YR 5/6) iron stains; few patchy very dark gray (10YR 3/1) and thin discontinuous gray (10YR 5/1) clay films on faces of peds; about 4 percent gravel; neutral; clear wavy boundary.

2Btg3—37 to 42 inches; dark gray (10YR 4/1) gravelly clay loam; common medium distinct yellowish brown (10YR 5/6) and few medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few yellowish red (5YR 5/6) iron stains; few patchy very dark gray (10YR 3/1) and thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 22 percent gravel; mildly alkaline; clear wavy boundary.

2Btg4—42 to 52 inches; yellowish brown (10YR 5/6) gravelly loam; common fine distinct grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/4) mottles; weak coarse angular blocky structure; few patchy very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay films on faces of peds; thin patchy black (10YR 2/1) organic stains on faces of peds; few yellowish red (5YR 5/6) iron stains on faces of peds; about 20 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2C1—52 to 58 inches; yellowish brown (10YR 5/4) gravelly sandy loam; common fine faint yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; massive; friable; common fine roots; many medium pores; about 35 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

2C2—58 to 65 inches; yellowish brown (10YR 5/4) gravelly coarse sandy loam and gravelly loamy sand; common fine faint yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; massive and single grain; friable and loose; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum ranges from strongly acid to neutral in the upper part and from neutral to moderately alkaline in the lower part. The depth to calcareous material ranges from 28 to 55 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam, clay loam, sandy clay loam, or loam. The 2Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is gravelly clay loam, gravelly sandy loam, or gravelly loam. The 2C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is dominantly gravelly loam, gravelly coarse sandy loam, or gravelly sandy loam and has strata of gravelly fine sand or gravelly loamy sand.

Millsdale Series

The Millsdale series consists of moderately deep, very poorly drained, moderately slowly permeable soils in depressions on bedrock terraces. These soils formed in glacial drift underlain by limestone. Slopes range from 0 to 2 percent.

Millsdale soils are similar to Milford and Pewamo soils and commonly are adjacent to Milton Variant and Randolph soils. Milford and Pewamo soils are more than 60 inches deep to limestone. Milton Variant and Randolph soils are browner throughout the solum than the Millsdale soils. They are in the slightly higher landscape positions.

Typical pedon of Millsdale silty clay loam, in a cultivated field; 725 feet east and 1,620 feet north of the southwest corner of sec. 29, T. 27 N., R. 11 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 13 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

Bt—13 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; few fine distinct dark yellowish brown (10YR 4/4) and few fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings and clay films on faces of peds; neutral; clear wavy boundary.

Btg1—18 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam, dark gray (10YR 4/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; thin continuous very dark gray (10YR 3/1) organic coatings and clay films on faces of peds; neutral; clear smooth boundary.

2Btg2—23 to 26 inches; gray (10YR 5/1) silty clay; common medium faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate fine angular blocky; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; many coarse black (10YR 2/1) stains of iron and manganese oxide in old root channels and in pores; about 12 percent limestone channers and gravel; slight effervescence; mildly alkaline; abrupt smooth boundary.

R—26 to 40 inches; limestone that is weathered in the upper 3 inches and is hard below.

The solum is 20 to 40 inches thick. The Ap horizon has value of 2 or 3. The Bt and 2Bt horizons have value of 3 to 6. They are dominantly silty clay loam, but the range includes clay loam or silty clay.

Milton Variant

The Milton Variant consists of shallow, well drained, moderately slowly permeable soils on bedrock terraces. These soils formed in loamy and clayey glacial drift underlain by limestone. Slopes range from 0 to 2 percent.

Milton Variant soils are commonly adjacent to Millsdale and Randolph soils. Millsdale and Randolph soils are grayer in the solum than the Milton Variant soils and are lower on the landscape.

Typical pedon of Milton Variant silt loam, 0 to 2 percent slopes, in a hayfield; 100 feet north and 1,400 feet east of the southwest corner of sec. 18, T. 27 N., R. 11 E.

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; many fine roots; neutral; abrupt wavy boundary.

BA—10 to 13 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; firm; few fine roots; about 1 percent gravel; neutral; clear smooth boundary.

2Bt—13 to 18 inches; dark yellowish brown (10YR 4/4) clay; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine and coarse roots; thick continuous dark brown (10YR 3/3) clay films on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

R—18 to 40 inches; limestone that is partially weathered in the upper 2 inches and is hard below.

The thickness of the solum and the depth to bedrock are 10 to 20 inches. The Ap horizon has chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It is slightly acid or neutral.

Morley Series

The Morley series consists of deep, well drained, moderately slowly permeable or slowly permeable soils on till plains and moraines. These soils formed in glacial till. Slopes range from 2 to 30 percent.

Morley soils are commonly adjacent to Blount, Coesse, Eldean, Glynwood, and Glynwood Variant soils. Blount, Coesse, Glynwood, and Glynwood Variant soils are grayer in the solum than the Morley soils and are lower on the landscape. Eldean soils are underlain by loose sand and gravel and are in the less sloping areas on stream terraces.

Typical pedon of Morley silt loam, 4 to 8 percent slopes, eroded, in a cultivated field; 363 feet east and 140 feet north of the southwest corner of sec. 1, T. 28 N., R. 11 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; few dark grayish brown (10YR 4/2) coatings of silt on faces of peds; about 3 percent fine gravel; strongly acid; clear wavy boundary.

Bt2—18 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct brown (10YR 4/3) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; common very fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; thin patchy very dark grayish brown (10YR 3/2) organic-stained clay films on faces of peds and in vertical channels; slight effervescence; mildly alkaline; clear wavy boundary.

Bt3—23 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak thick platy; firm; few very fine roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; thin patchy white (10YR 8/1) coatings of carbonate on faces of peds; about 2 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

C1—30 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint yellowish brown (10YR 5/6) mottles; weak very thick platy structure; very firm; few very fine roots; thin discontinuous white (10YR 8/1) coatings of carbonate on faces of peds; about 5 percent fine gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—40 to 60 inches; yellowish brown (10YR 5/4) clay loam; many fine faint yellowish brown (10YR 5/6) mottles; weak thick platy structure; very firm; few very fine roots; thin discontinuous white (10YR 8/1) coatings of carbonate on faces of peds; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 20 to 35 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly loam or silt loam, but the range includes silty clay loam and clay loam in the severely eroded areas. The Bt horizon has chroma of 3 to 6. It is clay loam, silty clay loam, clay, or silty clay. It is neutral to strongly acid in the upper part and medium acid to mildly alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Pella Series

The Pella series consists of deep, poorly drained, moderately slowly permeable or moderately permeable soils in depressions on till plains. The soils formed in silty and loamy sediments. Slopes range from 0 to 2 percent.

Pella soils are similar to Milford soils and commonly are adjacent to Blount, Del Rey, Haskins Variant, and Wallkill soils. Milford soils contain more clay and less silt in the solum and substratum than the Pella soils. Blount, Del Rey, and Haskins Variant soils have a surface layer that is lighter in color than that of the Pella soils. They are on the slightly higher rises. Wallkill soils consist of mineral deposits underlain by organic material. They are in the lower depressions.

Typical pedon of Pella mucky silty clay loam, sandy substratum, in a cultivated field; 600 feet west and 900 feet south of the northeast corner of sec. 24, T. 26 N., R. 11 E.

Ap—0 to 10 inches; black (10YR 2/1) mucky silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine and very fine roots; common fine pores; neutral; abrupt smooth boundary.

AB—10 to 14 inches; very dark grayish brown (2.5Y 3/2) silty clay loam, grayish brown (10YR 5/2) dry; common fine prominent yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; many fine and very fine roots; few medium pores; very dark gray (10YR 3/1) organic stains on faces of peds; neutral; clear wavy boundary.

Btg1—14 to 20 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8) and common fine faint dark grayish brown (2.5Y 4/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many fine and very fine roots; common fine pores; thin discontinuous black (10YR 2/1) organic stains in old root channels and in pores; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; mildly alkaline; clear wavy boundary.

Btg2—20 to 28 inches; dark grayish brown (2.5Y 4/2) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine pores; thin continuous very dark grayish brown (10YR 3/2) organic stains in old root channels and in pores; slight effervescence; moderately alkaline; clear wavy boundary.

Btg3—28 to 38 inches; dark grayish brown (2.5Y 4/2) silt loam; many medium prominent dark yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous very dark grayish brown (10YR 3/2) organic stains in old root channels and in pores; slight effervescence; moderately alkaline; clear wavy boundary.

Cg—38 to 50 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; firm; thin patchy brown (10YR 5/3) coatings of silt on faces of fractures; strong effervescence; moderately alkaline; clear wavy boundary.

C—50 to 60 inches; light olive brown (2.5Y 5/4) silt loam and thin strata of loamy sand and sand; many fine prominent yellowish brown (10YR 5/6) and common medium prominent yellowish brown (10YR 5/8) mottles; very weak thick platy structure; firm; thin patchy brown (10YR 5/3) coatings of silt on faces of fractures; strong effervescence; moderately alkaline.

The solum is 30 to 50 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam, silty clay loam, or clay loam. The textural control section averages 18 to 35 percent clay.

Pewamo Series

The Pewamo series consists of deep, very poorly drained soils on till plains and moraines. These soils formed in silty or clayey sediments over glacial till. They are moderately slowly permeable. Slopes range from 0 to 2 percent.

Pewamo soils are similar to Milford and Millsdale soils and are commonly adjacent to Blount, Coesse, Del Rey, Glynwood, and Haskins Variant soils. Milford soils are underlain by lacustrine deposits. Millsdale soils formed in glacial till underlain by limestone. Blount, Coesse, Del Rey, Glynwood, and Haskins Variant soils do not have a thick, dark surface layer and are in the higher landscape positions.

Typical pedon of Pewamo silty clay loam, in a cultivated field; 1,419 feet east and 264 feet north of the southwest corner of sec. 5, T. 28 N., R. 12 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak medium angular blocky structure; firm; common fine and very fine roots; slightly acid; abrupt wavy boundary.

Btg1—10 to 19 inches; dark gray (10YR 4/1) silty clay; common fine distinct brown (10YR 4/3) and common fine prominent brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; few fine and very fine roots concentrated along faces of peds; thin continuous very dark gray (10YR 3/1) organic-stained clay films on faces of peds; neutral; clear wavy boundary.

Btg2—19 to 26 inches; gray (10YR 5/1) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots concentrated along faces of peds; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and thin patchy very dark gray (10YR 3/1) organic-stained clay films concentrated in vertical channels; neutral; clear wavy boundary.

2Btg3—26 to 36 inches; gray (10YR 5/1) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots concentrated along faces of prisms; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and thin patchy very dark gray (10YR 3/1) organic-stained clay films concentrated in vertical channels; about 2 percent gravel; neutral; clear wavy boundary.

2Btg4—36 to 43 inches; gray (10YR 5/1) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few very fine roots concentrated along faces of prisms; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 2 percent gravel; neutral; gradual wavy boundary.

2Btg5—43 to 55 inches; grayish brown (10YR 5/2) silty clay loam; many fine distinct yellowish brown (10YR

5/6) and few fine faint gray (10YR 6/1) mottles; weak medium prismatic structure; firm; few very fine roots concentrated along faces of prisms; thin patchy gray (10YR 5/1) clay films on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

2Cg—55 to 65 inches; gray (10YR 5/1) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; about 3 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates are 50 to 70 inches. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silt loam. It is slightly acid or neutral. The Btg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, clay loam, or silty clay. It is slightly acid to mildly alkaline. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is clay loam or silty clay loam. It is mildly alkaline or moderately alkaline.

Randolph Series

The Randolph series consists of moderately deep, somewhat poorly drained, moderately slowly permeable soils on bedrock terraces. These soils formed in glacial drift underlain by limestone. Slopes range from 0 to 2 percent.

Randolph soils are similar to Blount and Del Rey soils and are commonly adjacent to Millsdale and Milton Variant soils. Blount and Del Rey soils formed in more than 60 inches of silty and clayey deposits. Millsdale soils are grayer throughout the solum than the Randolph soils and are in depressions. Milton Variant soils are browner throughout the solum than the Randolph soils and are in the higher landscape positions.

Typical pedon of Randolph silt loam, 0 to 2 percent slopes, in a cultivated field; 575 feet east and 1,650 feet north of the southwest corner of sec. 29, T. 27 N., R. 11 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common medium faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; few medium vertical tubular pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds and in pores; about 1 percent gravel; slightly acid; clear smooth boundary.

Bt2—15 to 20 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few medium vertical tubular pores; thin continuous very dark grayish brown (10YR 3/2) clay films and black (10YR 2/1) organic coatings on faces of peds and in pores; about 6 percent gravel; mildly alkaline; clear smooth boundary.

Bt3—20 to 25 inches; yellowish brown (10YR 5/4) clay loam; weak fine prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few medium vertical tubular pores; thin continuous dark gray (10YR 4/1) clay films and black (10YR 2/1) and very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores; about 8 percent gravel; slight effervescence; mildly alkaline; clear smooth boundary.

R—25 to 40 inches; limestone that is weathered in the upper 3 inches and is hard below.

The thickness of the solum and the depth to bedrock are 20 to 40 inches. The Ap horizon is loam or silt loam. The Bt horizon has value of 4 or 5. It is dominantly clay loam, but it ranges to silty clay loam in the upper part. It is slightly acid to mildly alkaline.

Rawson Variant

The Rawson Variant consists of deep, moderately well drained soils on till plains and moraines. These soils formed in loamy material underlain by glacial till. They are moderately permeable in the upper part and slowly permeable in the lower part. Slopes range from 2 to 12 percent.

Rawson Variant soils are commonly adjacent to Glynwood and Haskins Variant soils. Glynwood soils have more clay in the subsoil than the Rawson Variant soils. Haskins Variant soils are grayer throughout than the Rawson Variant soils. Both soils are in the lower landscape positions.

Typical pedon of Rawson Variant fine sandy loam, 2 to 6 percent slopes, in a cultivated field; 260 feet west and 1,700 feet south of the northeast corner of sec. 23, T. 28 N., R. 11 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) fine sandy loam, brown (10YR 5/3) dry; weak medium granular structure; friable; many very fine and common fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 14 inches; dark yellowish brown (10YR 4/4) loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; common fine roots; bridges of clay between sand grains; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—14 to 23 inches; brown (7.5YR 5/4) sandy clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

Bt3—23 to 31 inches; brown (7.5YR 5/4) sandy clay loam; common fine faint strong brown (7.5YR 5/6) and few fine distinct strong brown (7.5YR 5/8) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; medium acid; clear wavy boundary.

Bt4—31 to 42 inches; brown (7.5YR 4/4) sandy clay loam; few fine faint strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few very fine roots; thin continuous dark brown (7.5YR 3/4) clay films and black (10YR 2/1) organic stains on faces of peds; about 1 percent gravel; medium acid; clear wavy boundary.

2Bt5—42 to 48 inches; brown (7.5YR 4/4) clay loam; common medium prominent grayish brown (10YR 5/2) and common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy dark brown (7.5YR 3/4) clay films on faces of peds; thin continuous black (10YR 2/1) organic stains in old root channels and in pores; about 3 percent gravel; neutral; abrupt wavy boundary.

2C—48 to 60 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct gray (10YR 6/1) and common fine faint yellowish brown (10YR 5/6) mottles; moderate medium platy structure; very firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; thin continuous white (10YR 8/1) coatings of carbonate on faces of peds; about 4 percent gravel; strong effervescence; moderately alkaline.

The solum is 26 to 48 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly clay loam or sandy clay loam, but the range includes loam and sandy loam. The horizon is neutral to strongly acid. The 2C horizon is silty clay loam or clay loam.

Rensselaer Series

The Rensselaer series consists of deep, very poorly drained, moderately permeable soils on terraces. These soils formed in loamy and silty outwash sediments. Slopes range from 0 to 2 percent.

Rensselaer soils are similar to Millgrove soils and commonly are adjacent to Sloan, Tuscola, and Whitaker soils. Millgrove soils have more sand and gravel in the substratum than the Rensselaer soils. Sloan soils have more silt throughout than the Rensselaer soils. They are on the lower flood plains. Tuscola and Whitaker soils are browner in the solum than the Rensselaer soils. They are in the slightly higher landscape positions.

Typical pedon of Rensselaer loam, in a hayfield; 300 feet west and 2,260 feet north of the southeast corner of sec. 20, T. 25 N., R. 13 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

A—10 to 16 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; common medium prominent light olive brown (2.5Y 5/4) mottles; weak medium platy structure; friable; common fine and very fine roots; thick discontinuous very dark grayish brown (10YR 3/2) organic stains on faces of peds; neutral; clear wavy boundary.

Bt1—16 to 25 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct yellowish brown (10YR 5/4) and gray (10YR 5/1) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; friable; common very fine roots; thick discontinuous very dark grayish brown (10YR 3/2) organic-stained clay films on faces of peds; neutral; clear wavy boundary.

Bt2—25 to 35 inches; dark grayish brown (10YR 4/2) clay loam; common medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; many fine and medium roots; thick continuous very dark gray (10YR 3/1) and thick discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

Bt3—35 to 43 inches; grayish brown (10YR 5/2) clay loam; many medium distinct yellowish brown (10YR 5/6) and common fine faint light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; common fine and medium roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

C1—43 to 55 inches; yellowish brown (10YR 5/6) loam; common medium distinct grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) and common fine prominent dark gray (10YR 4/1) mottles; massive; firm; few fine roots; neutral; clear smooth boundary.

C2—55 to 70 inches; yellowish brown (10YR 5/6) loam and thin strata of sandy loam and loamy sand; many coarse distinct grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/8) mottles; massive; very friable; slight effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or clay loam. The C horizon is dominantly silt loam or loam and has thin strata of fine sand, sandy loam, or loamy sand.

Ross Series

The Ross series consists of deep, well drained, moderately permeable soils on broad flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Ross soils are similar to Belmore Variant soils and are commonly adjacent to Eel, Shoals, and Sloan soils. The Belmore Variant soils have a thinner mollic epipedon than the Ross soils and are underlain by stratified coarse sand and gravelly coarse sand. They are on stream terraces and outwash plains. Eel, Shoals, and Sloan soils have gray mottles in the upper part of the solum and are lower on the landscape than the Ross soils.

Typical pedon of Ross loam, frequently flooded, in a cornfield; 400 feet north and 1,500 feet west of the southeast corner of sec. 18, T. 25 N., R. 11 E.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

A—12 to 17 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate coarse subangular blocky structure; friable; thin patchy very dark brown (10YR 2/2) organic coatings on faces of peds; neutral; clear smooth boundary.

Bw1—17 to 25 inches; dark brown (10YR 3/3) loam, dark brown (7.5YR 4/4) dry; moderate medium subangular blocky structure; friable; thin patchy very dark brown (10YR 2/2) organic coatings on faces of peds; neutral; clear smooth boundary.

Bw2—25 to 30 inches; dark yellowish brown (10YR 4/4) loam, brown (7.5YR 5/4) dry; weak coarse subangular blocky structure; friable; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.

Bw3—30 to 41 inches; dark yellowish brown (10YR 4/4) loam, brown (7.5YR 5/4) dry; moderate medium and coarse subangular blocky structure; friable; thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; mildly alkaline; clear smooth boundary.

Bw4—41 to 50 inches; dark yellowish brown (10YR 4/4) loam, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; friable; thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; mildly alkaline; clear smooth boundary.

C—50 to 60 inches; dark yellowish brown (10YR 4/4) sandy loam; massive; friable; mildly alkaline.

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 Bw horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 to 6. It is sandy loam, loam, or silt loam.

Saranac Series

The Saranac series consists of deep, very poorly drained, moderately slow permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Saranac soils are similar to Coesse soils and commonly are adjacent to Armiesburg soils. Coesse soils have less clay in the upper part of the solum than the Saranac soils. Armiesburg soils are well drained and are in the slightly higher landscape positions.

Typical pedon of Saranac silty clay loam, frequently flooded, in a cultivated field; 231 feet east and 165 feet north of the southwest corner of sec. 8, T. 28 N., R. 12 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; firm; common fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Bg1—10 to 15 inches; dark gray (10YR 4/1) silty clay loam; many medium prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; few fine and very fine roots concentrated along faces of peds; neutral; clear wavy boundary.

Bg2—15 to 21 inches; dark gray (10YR 4/1) silty clay loam; many medium prominent yellowish red (5YR

4/6 and 5/6) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; few fine and very fine roots concentrated along faces of peds; few fine black (10YR 2/1) accumulations of iron; neutral; clear wavy boundary.

Bg3—21 to 30 inches; dark gray (10YR 4/1) silty clay; common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots concentrated along faces of peds; few fine black (10YR 2/1) accumulations of iron; slightly acid; clear wavy boundary.

Bg4—30 to 40 inches; gray (10YR 5/1) silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots concentrated along faces of peds; few fine black (10YR 2/1) accumulations of iron oxide and common fine dark red (2.5YR 3/6) cylindrical accumulations of soft iron oxide in relict root channels; slightly acid; gradual wavy boundary.

Bg5—40 to 45 inches; grayish brown (10YR 5/2) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine roots concentrated along faces of peds; few fine black (10YR 2/1) rounded accumulations of soft iron oxide and common fine yellowish red (5YR 5/8) cylindrical accumulations of soft iron oxide in relict root channels; slightly acid; gradual wavy boundary.

Bg6—45 to 55 inches; gray (10YR 5/1) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; few very fine roots concentrated along faces of peds; few fine black (10YR 2/1) rounded accumulations of soft iron oxide and few fine yellowish red (5YR 5/8) cylindrical accumulations of soft iron oxide in relict root channels; neutral; clear wavy boundary.

Cg—55 to 60 inches; gray (10YR 6/1) clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is neutral or mildly alkaline. The Bg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, silty clay, or clay loam. It is slightly acid to mildly alkaline.

Shoals Series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Shoals soils commonly are adjacent to Eel, Ross, and Sloan soils. Eel and Ross soils are browner throughout the solum than the Shoals soils. They are in the slightly higher landscape positions. Sloan soils have a darker surface layer than the Shoals soils. They are in the lower landscape positions.

Typical pedon of Shoals loam, frequently flooded, in a cultivated field; 160 feet south and 1,080 feet west of the northeast corner of sec. 13, T. 28 N., R. 11 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; common fine and very fine roots; neutral; abrupt smooth boundary.

A—10 to 17 inches; brown (10YR 4/3) loam; common fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; common medium and fine roots; thin very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) organic coatings on faces of peds; neutral; clear wavy boundary.

Cg—17 to 30 inches; dark grayish brown (10YR 4/2) loam; many fine faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; firm; few very fine roots; thin very dark grayish brown (10YR 3/2) organic coatings in root channels; neutral; clear wavy boundary.

C1—30 to 39 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine and very fine roots; thin patchy dark grayish brown (10YR 4/2) organic coatings on faces of peds and in root channels; neutral; clear wavy boundary.

C2—39 to 47 inches; brown (10YR 5/3) loam; common fine distinct yellowish brown (10YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; weak coarse angular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) coatings of silt on faces of peds and in root channels; neutral; clear wavy boundary.

C3—47 to 60 inches; brown (10YR 5/3) loam; common fine distinct yellowish brown (10YR 5/6), common fine faint grayish brown (10YR 5/2), and few fine distinct brown (7.5YR 4/4) mottles; massive; firm; few thin dark grayish brown (10YR 4/2) coatings of silt in root channels; neutral.

The A horizon is silt loam or loam. The C horizon is dominantly loam or sandy clay loam, but it has individual subhorizons of fine sandy loam, clay loam, silt loam, or silty clay loam. It is neutral to moderately alkaline.

Sloan Series

The Sloan series consists of deep, very poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Sloan soils are commonly adjacent to Eel, Ross, and Shoals soils. Eel and Ross soils are browner in the solum than the Sloan soils and are in the higher landscape positions. Shoals soils do not have a thick, dark surface layer. They are in the slightly higher landscape positions.

Typical pedon of Sloan silty clay loam, frequently flooded, in a cultivated field; 720 feet east and 116 feet south of the northwest corner of sec. 9, T. 26 N., R. 11 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

Bg1—11 to 15 inches; dark grayish brown (2.5Y 4/2) clay loam; common fine distinct dark gray (10YR 4/1) and few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

Bg2—15 to 24 inches; dark gray (10YR 4/1) clay loam; few fine prominent light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; few fine roots; neutral; clear wavy boundary.

Bg3—24 to 30 inches; dark gray (10YR 4/1) clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

Bg4—30 to 36 inches; dark gray (10YR 4/1) clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; neutral; gradual wavy boundary.

Cg1—36 to 54 inches; dark gray (10YR 4/1) clay loam; few fine prominent dark grayish brown (2.5Y 4/2) mottles; massive; firm; neutral; gradual wavy boundary.

Cg2—54 to 58 inches; grayish brown (10YR 5/2), stratified loam, silt loam, and sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; neutral; abrupt wavy boundary.

Cg3—58 to 60 inches; dark grayish brown (10YR 4/2) clay loam and strata of silt loam and gravelly sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; mildly alkaline.

The solum is 30 to 50 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes silt loam and loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is clay loam, silt loam, or silty clay loam.

Tuscola Series

The Tuscola series consists of deep, moderately well drained, moderately permeable soils on outwash plains. These soils formed in silty or loamy outwash sediments. Slopes range from 1 to 6 percent.

Tuscola soils are similar to Haney soils and are adjacent to Rensselaer and Whitaker soils. Haney soils have less clay and more sand and gravel than the Tuscola soils. Rensselaer and Whitaker soils are grayer in the upper part of the subsoil than the Tuscola soils and are lower on the landscape.

Typical pedon of Tuscola loam, loamy substratum, 1 to 6 percent slopes, eroded, in a cultivated field; 1,580 feet west and 1,050 feet south of the northeast corner of sec. 33, T. 27 N., R. 12 E.

Ap—0 to 11 inches; yellowish brown (10YR 5/4) loam, very pale brown (10YR 7/4) dry; small chunks of dark brown (7.5YR 4/4) clay loam; moderate medium granular structure; friable; common fine roots; few fine pores; strongly acid; abrupt smooth boundary.

Bt1—11 to 17 inches; dark brown (7.5YR 4/4) clay loam; common medium distinct dark brown (10YR 4/3) and yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure parting to moderate fine subangular blocky; friable; few fine roots; few fine pores; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—17 to 22 inches; dark brown (7.5YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; many fine pores; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

Bt3—22 to 27 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2), dark yellowish brown (10YR 4/6), and strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many medium and fine pores; thin continuous dark brown (10YR 4/3) clay films and thin patchy very dark grayish brown (10YR 3/2) organic stains on faces of peds; neutral; clear wavy boundary.

Bt4—27 to 36 inches; yellowish brown (10YR 5/4) sandy clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine roots; many fine pores; thick discontinuous dark brown (10YR 4/3) and thin patchy yellowish red (5YR 4/6) clay films on faces of peds; thin continuous very dark grayish brown (10YR 3/2) organic stains in old root channels and on faces of peds; moderately alkaline; clear wavy boundary.

BCt—36 to 42 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; thin patchy dark brown (10YR 4/3) clay films on faces of peds; thin patchy very dark grayish brown (10YR 3/2) organic stains in old root channels and on faces of peds; slight effervescence; moderately alkaline; clear wavy boundary.

C1—42 to 46 inches; yellowish brown (10YR 5/4) fine sandy loam; few fine faint yellowish brown (10YR 5/6) and moderate medium distinct grayish brown (10YR 5/2) mottles; massive; friable; strong effervescence; moderately alkaline; clear wavy boundary.

C2—46 to 54 inches; grayish brown (10YR 5/2) fine sandy loam; moderate fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C3—54 to 60 inches; light olive brown (2.5Y 5/4) fine sandy loam; few fine prominent grayish brown (10YR 5/2) mottles; massive; friable; about 1 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 50 inches thick. The content of gravel ranges from 0 to 5 percent in the upper part and from 0 to 10 percent in the lower part.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The A1 horizon, if it occurs, is 2 to 4 inches thick. It is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) loam or silt loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam or sandy clay loam. It is strongly acid to slightly acid in the upper part and slightly acid to moderately alkaline in the lower part. The BC horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6.

Wallkill Series

The Wallkill series consists of deep, very poorly drained soils in depressions on till plains and on broad bottom land. These soils formed in recent alluvium underlain by organic and limnic deposits. They are moderately permeable in the mineral layer, moderately rapidly permeable in the organic layer, and slowly permeable in the underlying coprogenous earth. Slopes range from 0 to 2 percent.

Wallkill soils are adjacent to Milford and Pella soils, which are not underlain by organic material. They are higher on the landscape than the Wallkill soils.

Typical pedon of Wallkill silt loam, coprogenous earth substratum, drained, in a cultivated field; 1,025 feet south and 2,500 feet east of the northwest corner of sec. 13, T. 25 N., R. 10 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; very strongly acid; abrupt smooth boundary.

Cg—8 to 17 inches; dark grayish brown (10YR 4/2) silt loam; common medium prominent olive brown (2.5Y 4/4) mottles; massive; friable; few fine black (10YR 2/1) accumulations of soft iron oxide; very strongly acid; abrupt wavy boundary.

2Oa1—17 to 21 inches; black (10YR 2/1 broken face and rubbed) sapric material; about 5 percent fiber, a trace rubbed; massive; friable; about 5 percent dark grayish brown (10YR 4/2) Cg horizon material; strongly acid; gradual wavy boundary.

2Oa2—21 to 26 inches; dark brown (7.5YR 3/2 broken face and rubbed) sapric material; about 40 percent fiber, a trace rubbed; weak thick platy structure; friable; medium acid; gradual wavy boundary.

2Oa3—26 to 41 inches; brown (7.5YR 4/2 broken face and rubbed) sapric material; about 10 percent fiber, a trace rubbed; weak thick platy structure; friable; medium acid; gradual wavy boundary.

3C1—41 to 46 inches; dark grayish brown (2.5Y 4/2) coprogenous earth; rebounds slightly when compressed; weak thick platy structure; friable; medium acid; gradual wavy boundary.

3C2—46 to 60 inches; dark grayish brown (2.5Y 4/2) coprogenous earth; about 40 percent fibers, less than 5 percent rubbed; rebounds slightly when compressed; weak thin platy structure; friable; slight effervescence; mildly alkaline.

The Ap horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is very strongly acid to neutral. The Cg horizon has hue of 10YR, value of 3 or 4, and chroma of 2. It is silt loam or silty clay loam. It is very strongly acid to neutral. The Oa horizon has hue of

7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly sapric material, but thin subhorizons of hemic material are in some pedons. The Oa horizon is strongly acid or medium acid. The C horizon has hue of 2.5Y, value of 3 to 5, and chroma of 1 to 4. It is dominantly coprogenous earth or marl, but thin subhorizons of mineral material are in some pedons. The C horizon is medium acid to moderately alkaline.

Whitaker Series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils on terraces. These soils formed in stratified silty and loamy outwash. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Digby and Haskins Variant soils and are commonly adjacent to Rensselaer and Tuscola soils. Digby soils have more clay in the solum than the Whitaker soils and are underlain by gravelly loam and sand. Haskins Variant soils formed in glacial till. Tuscola soils are moderately well drained and are in the higher landscape positions. Rensselaer soils are grayer throughout the solum than the Whitaker soils and are in the lower landscape positions.

Typical pedon of Whitaker silt loam, 0 to 2 percent slopes, in a cultivated field; 1,390 feet east and 1,710 feet north of the southwest corner of sec. 20, T. 27 N., R. 11 E.

Ap—0 to 11 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few medium and common fine roots; slightly acid; abrupt smooth boundary.

Bt1—11 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; friable; common very fine roots; thin continuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; few fine black (10YR 2/1) accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt2—18 to 26 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; friable; common very fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; few fine black (10YR 2/1) accumulations of iron and manganese oxide; thin discontinuous very dark grayish brown (10YR 3/2) organic stains on faces of peds; neutral; clear smooth boundary.

Bt3—26 to 34 inches; yellowish brown (10YR 5/6) loam; common medium distinct dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; common very fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; thin continuous black (10YR 2/1) accumulations of manganese oxide; few fine very dark grayish brown (10YR 3/2) organic stains on faces of peds; mildly alkaline; clear wavy boundary.

BCt—34 to 41 inches; yellowish brown (10YR 5/6) loam; few medium distinct dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; friable; thin patchy dark gray (10YR 4/1) clay films on faces of peds; thin continuous black (10YR 2/1) organic stains on faces of peds; slight effervescence; moderately alkaline; clear smooth boundary.

C—41 to 60 inches; yellowish brown (10YR 5/4) loam and sandy loam with strata of loamy sand; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has chroma of 2 or 3. The Bt horizon has chroma of 1 to 6. It is dominantly clay loam, but the range includes loam, sandy clay loam, and silty clay loam.

Formation of the Soils

The major factors of soil formation and their degree of importance in the formation of the soils in this survey area are discussed in this section. The processes of soil formation also are discussed.

Factors of Soil Formation

Soil is produced by soil-forming processes acting on geologic material. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material; (2) the climatic conditions in which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time 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 to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that is formed. Finally, time is needed to change the parent material into a soil that has genetically related horizons. Although the length of time needed varies, some time is required for the differentiation of all soil horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four factors. In addition, many of the processes of soil development are unknown.

Parent Material

Parent material is the unconsolidated mass from which a soil forms. The parent material in this survey area was deposited by glaciers or by meltwater from glaciers. Some of this material subsequently was reworked and redeposited by water and wind. The last glacier covered the area about 12,000 to 15,000 years ago.

The parent material determines the limits of the chemical and mineralogical composition of the soils. Although most of the parent material in the survey area is of common glacial origin, its properties vary greatly. Depending on how the material was deposited, the properties can vary within short distances. The parent material in the area is dominantly glacial till, outwash deposits, lacustrine deposits, alluvium, and organic deposits.

Glacial till was deposited with minimal water action as glacial ice melted. It consists of mixed particles of different sizes. Because of the limited water action, some small pebbles in the till have sharp, unworn corners. The glacial till in the survey area is very firm, calcareous silty clay loam and clay loam. Glynwood and Morley soils formed in glacial till. These soils typically are moderately fine textured, and they have a well developed subsoil.

Outwash material was deposited by meltwater flowing from glaciers. The size of the particles that make up the outwash material varies according to the velocity of the water. Coarser particles are carried and deposited by fast-moving water, and finer particles, such as very fine sand, silt, and clay, are carried and deposited by slower moving water. Outwash material generally consists of layers of similar-sized particles. Sandy loam, sand, gravel, and other coarse particles are dominant. Belmore Variant, Eldean Variant, and Eldean soils, for example, formed in outwash material.

Lacustrine material was deposited by still or ponded glacial meltwater. Because the coarser fragments were deposited as outwash by the moving meltwater, only the finer particles, such as very fine sand, silt, and clay, remained to settle out from the still water. Lacustrine deposits dominantly are silty or clayey, but they have thin lenses of sand. The soils in this survey area that formed in lacustrine deposits typically are fine textured. Milford and Pella soils are examples.

Recent alluvial material was deposited by the floodwater from streams. The texture of the material depends on the velocity of the floodwater. The alluvial material deposited along a swift stream, such as the Salamonie River, is coarser textured than that deposited along a slow, sluggish stream, such as the Wabash River. Armiesburg and Saranac soils, on bottom land, formed in alluvial material.

Organic material consists of plant remains. After the glaciers withdrew from the survey area, standing water remained in the depressions on lake plains and till plains. The grasses and sedges along the edges of the lakes died and their remains fell to the lake bottom. Because of the wetness, the plant remains did not decompose. Later, white cedar and other water-tolerant trees grew in these areas. As these trees died, their residue was deposited as organic material. The lakes eventually were filled with organic material that developed into peat. The plant remains in some areas subsequently decomposed and developed into muck. In other areas the material has been changed little since deposition. Wallkill soils formed partly in organic material.

Plant and Animal Life

Plants have had the greatest influence on the soils in this survey area; however, bacteria, fungi, and earthworms and the activities of human beings have also been important. The main contribution of plant and animal life is the addition of organic material and nitrogen into the soil. The kind of organic material on and in the soil depends on the kinds of plants present. The remains of these plants accumulate on the surface, decay, and eventually became organic matter. Roots of the plants provide channels for the downward movement of water through the soil and also add organic matter and nutrients that can be used by plants.

The native vegetation in the area was mainly deciduous forests. Differences in natural soil drainage and minor variations in parent material affect the composition of the forest species. In general, the well drained upland soils, such as Glynwood and Morley soils, were mainly covered with red oak, shagbark hickory, ash, and black walnut. Blount soils were covered with maple and beech. The wet soils supported primarily cottonwood, sycamore, willow, yellow poplar, and American basswood. A few soils also supported sphagnum moss and other mosses that contributed substantial amounts of organic matter.

Climate

Climate is important in the formation of soils. It determines the kinds of plant and animal life on and in the soil. It determines the amount of water available for the weathering of minerals and the transporting of soil material. Through its influence on soil temperature, it determines the rate that chemical reactions occur in the soil.

The climate in this survey area is cool and humid. It presumably is similar to that present when the soils formed. Because the climate is fairly uniform throughout the area, the differences in the soils are mainly a result of the other soil-forming factors.

Relief

Relief has had a marked influence on the soils in this survey area through its effect on natural drainage, erosion, plant cover, and soil temperature. The slope ranges from 0 to 30 percent. The natural drainage ranges from well drained in the soils on ridgetops to very poorly drained in those in depressions.

Relief influences the formation of soils by affecting runoff and drainage. Drainage in turn affects the aeration of soils, which influences soil color. The rate of runoff is highest on the steeper slopes and slowest in the low areas, where water is temporarily ponded. Water and air move freely through soils that are well drained but slowly through soils that are very poorly drained. In soils that are well aerated, the iron compounds that determine the color of most soils are bright and oxidized, but in poorly aerated soils they are dull gray and mottled. Morley soils are well drained and well aerated, and Pewamo soils are very poorly drained and poorly aerated.

Time

Time, usually a long time, is required for distinct horizons to form. The differences in the length of time that the parent material has been in place commonly are reflected in the degree of soil development; however, some soils develop rapidly and others slowly.

The soils in this survey area range from young to mature. The glacial deposits in which many of the soils formed have been subject to the soil-forming processes long enough for distinct horizons to develop. Some soils, however, such as those that formed in recent alluvial sediment, have not been in place long enough.

Armiesburg soils are young ones that formed in alluvial material. They have weakly developed horizons. Glynwood soils, on the other hand, have been in place for several thousands of years and have distinct horizons.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in this survey area. They include the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the leaching 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 this area. The content is low in some soils and high in others. Generally, the soils that have the most organic matter, such as Pella and Pewamo soils, have a thick, black surface layer.

Carbonates and bases have been leached from the upper horizons in most of the soils. Leaching generally is assumed to precede translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of the well drained soils. Even in the wettest soils, the absence of carbonates and the acid reaction indicate some leaching has taken place. Leaching in wet soils occurs slowly because of a high water table or because of the slow rate at which water moves through these soils.

Clay accumulates in pores and other voids and forms a film on the surfaces along which water moves. Leaching of bases and translocation of silicate clays are among the more important processes in the differentiation of horizons in the soils in this area. In some soils, such as Morley soils, translocated silicate clays have accumulated as clay films in the Bt horizon.

The reduction and transformation of iron, or gleying, have occurred in all of the very poorly drained, poorly drained, and somewhat poorly drained soils in the survey area. In the naturally wet soils, this process is significant in horizon differentiation. The gray color of the subsoil indicates a removal of iron oxides. A reduction of iron commonly is accompanied by a transfer of iron, either from the upper horizons to the lower horizons or from the profile completely. Mottles, which are in some horizons, indicate a segregation of iron.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

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.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

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.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainage, subsurface. Removal of excess ground water through buried drains in the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

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, or 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.

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.

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.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

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, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or 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 with hue of 10YR, 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.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

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.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

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.

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.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

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.

Slow intake (in tables). The slow movement of water into the soil.

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 substratum. The living roots and plant and animal activities are largely confined to the solum.

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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface 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.

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.

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.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-81 at Berne, Indiana)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	32.9	17.3	25.1	59	-11	25	2.24	1.13	3.21	6	7.8
February----	36.9	19.9	28.4	63	-8	31	2.07	1.02	2.97	5	7.7
March-------	47.4	28.9	38.2	77	4	112	3.20	1.71	4.51	8	6.0
April-------	61.5	39.8	50.7	84	21	328	3.91	2.17	5.44	9	.7
May---------	72.5	49.5	61.0	91	30	651	3.62	2.55	4.60	8	.0
June--------	82.0	58.9	70.5	96	41	915	4.37	2.69	5.87	8	.0
July--------	85.2	62.8	74.0	98	47	1,054	3.79	2.03	5.32	7	.0
August------	83.7	60.7	72.2	95	43	998	3.18	1.69	4.47	6	.0
September---	77.5	54.0	65.8	94	34	774	3.26	1.30	4.89	6	.0
October-----	65.4	42.8	54.1	86	24	445	2.46	1.18	3.56	6	.1
November----	49.7	33.0	41.4	74	11	118	2.69	1.35	3.85	7	3.1
December----	37.8	23.0	30.4	65	-6	34	2.66	1.12	3.96	6	7.2
Yearly:											
Average---	61.0	40.9	51.0	---	---	---	---	---	---	---	---
Extreme---	---	---	---	98	-13	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,485	37.45	32.80	41.93	82	32.6

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-81 at Berne, 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. 17	Apr. 28	May 16
2 years in 10 later than--	Apr. 12	Apr. 23	May 11
5 years in 10 later than--	Apr. 4	Apr. 14	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 20	Oct. 12	Sept. 30
2 years in 10 earlier than--	Oct. 25	Oct. 18	Oct. 5
5 years in 10 earlier than--	Nov. 4	Oct. 28	Oct. 14

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-81 at Berne, 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	194	175	148
8 years in 10	201	182	153
5 years in 10	214	196	165
2 years in 10	227	210	176
1 year in 10	234	217	182

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
An	Armiesburg silty clay loam, frequently flooded	447	0.2
BdA	Belmore Variant loam, 0 to 2 percent slopes, frequently flooded	234	0.1
BkB2	Blount-Del Rey silt loams, 1 to 4 percent slopes, eroded	42,200	17.8
Co	Coesse silt loam	368	0.2
DeA	Del Rey-Blount silt loams, 0 to 1 percent slopes	56,654	23.9
DkA	Digby silt loam, 0 to 2 percent slopes	488	0.2
Ee	Eel silt loam, frequently flooded	683	0.3
EoA	Eldean loam, 0 to 2 percent slopes	478	0.2
EoB2	Eldean loam, 2 to 6 percent slopes, eroded	246	0.1
EpC3	Eldean gravelly clay loam, 6 to 12 percent slopes, severely eroded	178	0.1
EsB2	Eldean Variant silt loam, 2 to 6 percent slopes, eroded	775	0.3
GnB2	Glynwood silt loam, 2 to 5 percent slopes, eroded	17,863	7.5
GpB3	Glynwood clay loam, 2 to 6 percent slopes, severely eroded	1,893	0.8
GtA	Glynwood Variant silt loam, 0 to 2 percent slopes	247	0.1
HaA	Haney silt loam, 0 to 2 percent slopes	533	0.2
HbA	Haskins Variant loam, 0 to 2 percent slopes	1,191	0.5
Mh	Milford silty clay loam	11,381	4.8
Mk	Milford silty clay loam, stratified sandy substratum	860	0.4
Mn	Millgrove clay loam	745	0.3
Mo	Millsdale silty clay loam	489	0.2
MsA	Milton Variant silt loam, 0 to 2 percent slopes	272	0.1
MuB2	Morley loam, moderately slow permeability, 2 to 6 percent slopes, eroded	551	0.2
MuE	Morley loam, 15 to 30 percent slopes	655	0.3
MvC2	Morley silt loam, 4 to 8 percent slopes, eroded	3,418	1.4
MxC3	Morley clay loam, 6 to 12 percent slopes, severely eroded	2,178	0.9
Pg	Pella silty clay loam, till substratum	497	0.2
Pk	Pella mucky silty clay loam, sandy substratum	1,327	0.6
Pm	Pewamo silty clay loam	75,972	32.1
Py	Pits, quarry	149	0.1
RdA	Randolph silt loam, 0 to 2 percent slopes	333	0.1
RlB	Rawson Variant fine sandy loam, 2 to 6 percent slopes	881	0.4
RlC	Rawson Variant fine sandy loam, 6 to 12 percent slopes	154	0.1
Rr	Rensselaer loam	1,499	0.6
Rz	Ross loam, frequently flooded	491	0.2
Se	Saranac silty clay loam, frequently flooded	1,463	0.6
Sp	Shoals loam, frequently flooded	1,726	0.7
Sv	Sloan silty clay loam, frequently flooded	2,740	1.2
TuB2	Tuscola loam, loamy substratum, 1 to 6 percent slopes, eroded	928	0.4
Ud	Udorthents, loamy	1,555	0.7
Wa	Wallkill silt loam, coprogenous earth substratum, drained	150	0.1
Wd	Wallkill silt loam, undrained	73	*
WsA	Whitaker silt loam, 0 to 2 percent slopes	1,138	0.5
	Water areas less than 40 acres in size	797	0.3
	Total	236,900	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
An	Armiesburg silty clay loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
BdA	Belmore Variant loam, 0 to 2 percent slopes, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
BkB2	Blount-Del Rey silt loams, 1 to 4 percent slopes, eroded (where drained)
Co	Coesse silt loam (where drained)
DeA	Del Rey-Blount silt loams, 0 to 1 percent slopes (where drained)
DkA	Digby silt loam, 0 to 2 percent slopes (where drained)
Ee	Eel silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
EoA	Eldean loam, 0 to 2 percent slopes
EoB2	Eldean loam, 2 to 6 percent slopes, eroded
EsB2	Eldean Variant silt loam, 2 to 6 percent slopes, eroded
GnB2	Glynwood silt loam, 2 to 5 percent slopes, eroded
GtA	Glynwood Variant silt loam, 0 to 2 percent slopes
HaA	Haney silt loam, 0 to 2 percent slopes
HbA	Haskins Variant loam, 0 to 2 percent slopes (where drained)
Mh	Milford silty clay loam (where drained)
Mk	Milford silty clay loam, stratified sandy substratum (where drained)
Mn	Millgrove clay loam (where drained)
Mo	Millsdale silty clay loam (where drained)
MuB2	Morley loam, moderately slow permeability, 2 to 6 percent slopes, eroded
Pg	Pella silty clay loam, till substratum (where drained)
Pk	Pella mucky silty clay loam, sandy substratum (where drained)
Pm	Pewamo silty clay loam (where drained)
RdA	Randolph silt loam, 0 to 2 percent slopes (where drained)
RlB	Rawson Variant fine sandy loam, 2 to 6 percent slopes
Rr	Rensselaer loam (where drained)
Rz	Ross loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
Se	Saranac silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sp	Shoals loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sv	Sloan silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
TuB2	Tuscola loam, loamy substratum, 1 to 6 percent slopes, eroded
WsA	Whitaker silt loam, 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	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
An: Armiesburg	IIw	135	47	54	4.5	9.0
BdA: Belmore Variant	IIw	130	46	52	4.3	8.6
BkB2: Blount-Del Rey	IIe	100	35	45	3.3	6.6
Co: Coesse	IIw	125	44	50	4.1	8.2
DeA: Del Rey-Blount	IIw	105	37	47	3.5	7.0
DkA: Digby	IIw	130	46	65	4.3	8.6
Ee: Eel	IIw	120	42	48	4.8	8.0
EoA: Eldean	IIs	75	26	37	2.5	5.0
EoB2: Eldean	IIe	70	24	35	2.3	4.6
EpC3: Eldean	IVe	50	17	25	1.6	3.2
EsB2: Eldean Variant	IIe	65	23	32	2.1	4.2
GnB2: Glynwood	IIIe	90	31	40	3.0	6.0
GpB3: Glynwood	IIIe	80	28	36	2.6	5.2
GtA: Glynwood Variant	I	100	35	45	3.3	6.6
HaA: Haney	I	120	42	60	4.0	8.0
HbA: Haskins Variant	IIw	125	44	50	4.1	8.1
Mh: Milford	IIw	135	47	61	4.4	8.8
Mk: Milford	IIIw	135	47	---	4.4	8.8
Mn: Millgrove	IIw	130	45	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	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Mo----------------------- Millsdale	IIIw	105	37	47	3.5	7.0
MsA---------------------- Milton Variant	IIIs	55	19	25	1.8	3.6
MuB2--------------------- Morley	IIe	95	33	42	3.1	6.2
MuE---------------------- Morley	VIe	---	---	---	1.6	3.2
MvC2--------------------- Morley	IIIe	80	28	36	2.6	5.2
MxC3--------------------- Morley	IVe	70	24	31	2.3	4.6
Pg----------------------- Pella	IIw	150	52	60	5.0	10.0
Pk----------------------- Pella	IIw	150	52	60	5.0	10.0
Pm----------------------- Pewamo	IIw	130	45	58	4.3	8.6
Py**. Pits						
RdA---------------------- Randolph	IIIw	75	26	34	2.5	5.0
RlB---------------------- Rawson Variant	IIe	90	31	36	3.0	6.0
RlC---------------------- Rawson Variant	IIIe	75	26	30	2.5	5.0
Rr----------------------- Rensselaer	IIw	150	52	60	5.0	10.0
Rz----------------------- Ross	IIw	135	47	54	4.5	9.0
Se----------------------- Saranac	IIIw	125	44	56	4.1	8.2
Sp----------------------- Shoals	IIw	135	47	54	4.1	8.2
Sv----------------------- Sloan	IIIw	140	49	---	4.6	9.2
TuB2--------------------- Tuscola	IIe	105	37	42	3.5	7.0
Ud. Udorthents						

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Wa-------------------------- Wallkill	IIIw	120	42	48	---	8.0
Wd-------------------------- Wallkill	Vw	---	---	---	---	3.2
WsA------------------------- Whitaker	IIw	130	45	52	4.3	8.6

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	780	---	---	---	---
II	200,928	45,581	154,869	478	---
III	29,635	23,328	6,035	272	---
IV	2,356	2,356	---	---	---
V	73	---	73	---	---
VI	655	655	---	---	---
VII	---	---	---	---	---
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	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
An--------------- Armiesburg	8A	Slight	Slight	Slight	Slight	Yellow poplar--------	100	107	Eastern white pine, black walnut, yellow poplar.
						White oak-----------	90	72	
						Black walnut--------	70	---	
BdA-------------- Belmore Variant	8A	Slight	Slight	Slight	Slight	Yellow poplar--------	100	107	Eastern white pine, black walnut, yellow poplar.
						White oak-----------	90	72	
						Black walnut--------	70	---	
						Black cherry--------	---	---	
						Northern red oak----	---	---	
BkB2**:									
Blount----------	3C	Slight	Slight	Severe	Severe	White oak-----------	65	48	Eastern white pine, red pine, yellow poplar.
						Northern red oak----	65	48	
						Green ash-----------	---	---	
						Bur oak-------------	---	---	
						Pin oak-------------	---	---	
Del Rey---------	4C	Slight	Slight	Severe	Severe	White oak-----------	70	52	Austrian pine, green ash, pin oak, red maple.
						Northern red oak----	70	52	
						Green ash-----------	---	---	
						Bur oak-------------	---	---	
Co--------------- Coesse	5W	Slight	Severe	Severe	Severe	Pin oak-------------	85	67	White ash, swamp white oak, green ash, eastern white pine.
						Red maple-----------	70	43	
						Swamp white oak-----	---	---	
						White ash-----------	---	---	
						American sycamore---	---	---	
						Silver maple--------	---	---	
						Eastern cottonwood--	---	---	
DeA**:									
Del Rey---------	4C	Slight	Slight	Severe	Severe	White oak-----------	70	52	Austrian pine, green ash, pin oak, red maple.
						Northern red oak----	70	52	
						Green ash-----------	---	---	
						Bur oak-------------	---	---	
Blount----------	3C	Slight	Slight	Severe	Severe	White oak-----------	65	48	Eastern white pine, red pine, yellow poplar.
						Northern red oak----	65	48	
						Green ash-----------	---	---	
						Bur oak-------------	---	---	
						Pin oak-------------	---	---	

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
DkA------------- Digby	4A	Slight	Slight	Slight	Slight	Northern red oak----	80	62	White ash, red pine, eastern white pine, yellow poplar, white oak, northern red oak, green ash, black cherry, American sycamore, eastern cottonwood.
						White oak-----------	75	57	
						White ash-----------	---	---	
						Pin oak-------------	---	---	
						Black cherry--------	---	---	
						Sugar maple---------	---	---	
						Yellow poplar-------	---	---	
Ee-------------- Eel	8A	Slight	Slight	Slight	Slight	Yellow poplar-------	100	107	Eastern white pine, black walnut, yellow poplar.
						Eastern cottonwood--	---	---	
						White ash-----------	---	---	
						Black walnut--------	---	---	
EoA, EoB2, EpC3- Eldean	4A	Slight	Slight	Slight	Slight	Northern red oak----	80	62	Eastern white pine, black walnut, yellow poplar, white ash, red pine, white oak.
						Black oak-----------	80	62	
						White oak-----------	80	62	
						Black walnut--------	---	---	
						Black cherry--------	---	---	
						Sugar maple---------	---	---	
						White ash-----------	---	---	
						Yellow poplar-------	---	---	
EsB2------------ Eldean Variant	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Eastern white pine, white oak, yellow poplar, northern red oak, white ash.
						Yellow poplar-------	95	98	
						White ash-----------	---	---	
GnB2, GpB3------ Glynwood	4C	Slight	Slight	Moderate	Moderate	Northern red oak----	80	62	Austrian pine, yellow poplar, green ash, pin oak, red maple, black oak, American sycamore, eastern cottonwood.
						Black oak-----------	80	62	
						White oak-----------	80	62	
						Red maple-----------	---	---	
						Slippery elm--------	---	---	
						Black cherry--------	---	---	
						White ash-----------	---	---	
GtA------------- Glynwood Variant	4C	Slight	Slight	Moderate	Moderate	Northern red oak----	75	57	Austrian pine, yellow poplar, pin oak, green ash, black oak.
						Black oak-----------	75	57	
						White oak-----------	75	57	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Wind-throw hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
HaA------------- Haney	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow poplar-------	75 80 --- --- --- --- ---	57 62 --- --- --- --- ---	Eastern white pine, white ash, black walnut, yellow poplar, red pine, northern red oak, white oak.
HbA------------- Haskins Variant	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Pin oak-------------	75 80 90	57 62 72	Red maple, white ash, eastern white pine, yellow poplar.
Mn-------------- Millgrove	5W	Slight	Severe	Severe	Severe	Pin oak------------- Swamp white oak----- Red maple----------- Eastern cottonwood-- Green ash-----------	86 85 --- --- ---	68 67 --- --- ---	Swamp white oak, eastern cottonwood, green ash, pin oak, red maple, silver maple, American sycamore, sweetgum.
Mo-------------- Millsdale	5W	Slight	Severe	Severe	Severe	Pin oak------------- Red maple----------- Eastern cottonwood-- Black cherry-------- Green ash----------- Swamp white oak-----	86 --- --- --- --- ---	68 --- --- --- --- ---	Red maple, American sycamore, eastern cottonwood, pin oak, green ash, swamp white oak, sweetgum.
MuB2------------ 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.
MuE------------- 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.

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
MvC2, MxC3------ Morley	4A	Slight	Slight	Slight	Slight	White oak-----------	80	62	White oak, black walnut, green ash, eastern white pine, red pine, white spruce.
						Northern red oak----	80	62	
						Yellow poplar-------	90	90	
						Black walnut--------	---	---	
						Bur oak-------------	---	---	
						Shagbark hickory----	---	---	
Pm-------------- Pewamo	5W	Slight	Severe	Severe	Severe	Pin oak-------------	90	72	White ash, eastern white pine, red maple, green ash.
						Swamp white oak-----	---	---	
						Red maple-----------	71	44	
						White ash-----------	71	67	
						Eastern cottonwood--	98	---	
						Green ash-----------	---	---	
RdA------------- Randolph	4A	Slight	Slight	Slight	Slight	Northern red oak----	75	57	Eastern white pine, yellow poplar.
						Sugar maple---------	90	55	
						Yellow poplar-------	85	81	
RlB, RlC-------- Rawson Variant	4A	Slight	Slight	Slight	Slight	White oak-----------	75	57	Eastern white pine, yellow poplar, black walnut, white ash, red pine, northern red oak.
						Northern red oak----	80	57	
						Black walnut--------	---	---	
						Sugar maple---------	---	---	
						White ash-----------	---	---	
						Yellow poplar-------	---	---	
Rr-------------- Rensselaer	5W	Slight	Severe	Severe	Severe	Pin oak-------------	86	68	Eastern white pine, sweetgum, red maple, white ash.
						White oak-----------	75	57	
						Sweetgum------------	90	106	
						Northern red oak----	76	58	
Rz-------------- Ross	5A	Slight	Slight	Slight	Slight	Northern red oak----	86	68	Eastern white pine, black walnut, white ash, yellow poplar.
						Yellow poplar-------	96	100	
						Sugar maple---------	85	52	
						White oak-----------	---	---	
						Black walnut--------	---	---	
						Black cherry--------	---	---	
						White ash-----------	---	---	
Se-------------- Saranac	5W	Slight	Severe	Moderate	Moderate	Pin oak-------------	85	67	Eastern white pine, red maple, white ash, sweetgum.
						Red maple-----------	---	---	
						Bur oak-------------	---	---	
						White ash-----------	---	---	
						Sweetgum------------	---	---	
Sp-------------- Shoals	5W	Slight	Moderate	Moderate	Slight	Pin oak-------------	90	72	Sweetgum, red maple, swamp chestnut oak, pin oak, yellow poplar.
						Sweetgum------------	86	95	
						Yellow poplar-------	90	90	
						Virginia pine-------	90	135	
						Eastern cottonwood--	---	---	
						White ash-----------	---	---	

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
Sv: Sloan	5W	Slight	Severe	Moderate	Moderate	Pin oak	86	68	Red maple, green ash, eastern cottonwood, sweetgum, pin oak, swamp white oak, silver maple, American sycamore.
						Swamp white oak	---	---	
						Red maple	---	---	
						Green ash	---	---	
						Eastern cottonwood	---	---	
TuB2: 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	
						Sugar maple	---	---	
Wa: Wallkill	2W	Slight	Severe	Severe	Severe	White ash	52	37	Green ash, silver maple, swamp white oak, pin oak.
						Eastern cottonwood	---	---	
						Silver maple	---	---	
						Black willow	---	---	
						Green ash	---	---	
Wd: Wallkill	3W	Slight	Severe	Severe	Severe	Pin oak	65	48	Red maple, green ash, eastern cottonwood, pin oak, swamp white oak, sweetgum.
						Red maple	51	33	
						White ash	52	37	
						Quaking aspen	56	56	
						Black willow	---	---	
						Silver maple	---	---	
WsA: Whitaker	4A	Slight	Slight	Slight	Slight	White oak	70	52	Eastern white pine, white ash, red maple, yellow poplar, American sycamore.
						Pin oak	85	67	
						Yellow poplar	85	81	
						Sweetgum	80	79	
						Northern red oak	75	57	

* 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
An----------------- Armiesburg	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak, imperial Carolina poplar.
BdA--------------- Belmore Variant	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Austrian pine, white fir, Washington hawthorn, blue spruce.	Norway spruce-----	Eastern white pine, pin oak, imperial Carolina poplar.
BkB2*: Blount-----------	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
Del Rey----------	---	Amur privet, arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
Co----------------- Coesse	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Northern whitecedar, white fir, Norway spruce, Washington hawthorn, Austrian pine, blue spruce.	Eastern white pine	Pin oak, imperial Carolina poplar.
DeA*: Del Rey----------	---	Amur privet, arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	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
DeA*:					
Blount	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	Imperial Carolina poplar.
DkA Digby	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak, imperial Carolina poplar
Ee Eel	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak, imperial Carolina poplar.
EoA, EoB2, EpC3 Eldean	Siberian peashrub	Autumn olive, eastern redcedar, radiant crabapple, Washington hawthorn, Amur honeysuckle, lilac.	Austrian pine, eastern white pine, jack pine, red pine.	---	---
EsB2 Eldean Variant	Siberian peashrub	Eastern redcedar, radiant crabapple, autumn olive, Washington hawthorn, lilac, Amur honeysuckle.	Eastern white pine, red pine, jack pine, Austrian pine.	---	---
GnB2, GpB3 Glynwood	---	Amur honeysuckle, Washington hawthorn, Amur privet, arrowwood, eastern redcedar, American cranberrybush.	Austrian pine, green ash, Osageorange.	Pin oak, eastern white pine.	---
GtA Glynwood Variant	---	Eastern redcedar, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Pin oak, eastern white pine.	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
HaA: Haney	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine, imperial Carolina poplar.
HbA: Haskins Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak, imperial Carolina poplar.
Mh: Milford	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak, imperial Carolina poplar.
Mk: Milford	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Washington hawthorn, Austrian pine, blue spruce, northern whitecedar, white fir, Norway spruce.	Eastern white pine	Pin oak.
Mn: Millgrove	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak, imperial Carolina poplar.
Mo: Millsdale	---	American cranberrybush, silky dogwood, Amur privet, Amur honeysuckle.	Northern whitecedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	---
MsA: Milton Variant	Siberian peashrub	Autumn olive, eastern redcedar, Amur honeysuckle, Amur honeysuckle, Washington hawthorn, radiant crabapple, lilac.	Red pine, eastern white pine, jack 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
MuB2, MuE, MvC2, MxC3: Morley	---	Amur honeysuckle, Washington hawthorn, eastern redcedar, Amur privet, arrowwood, American cranberrybush, silky dogwood.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
Pg, Pk: Pella	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak, imperial Carolina poplar.
Pm: Pewamo	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern whitecedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak, imperial Carolina poplar.
Py*. Pits					
RdA: Randolph	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
RlB, RlC: Rawson Variant	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern whitecedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
Rr: Rensselaer	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern whitecedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak, imperial Carolina poplar.
Rz: Ross	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine, 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
Se----------------- Saranac	---	American cranberrybush, Amur privet, Amur honeysuckle, silky dogwood.	Northern whitecedar, Washington hawthorn, white fir, blue spruce, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Sp----------------- Shoals	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern whitecedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak, imperial Carolina poplar.
Sv----------------- Sloan	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern whitecedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
TuB2--------------- Tuscola	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Ud. Udorthents					
Wa, Wd------------- Wallkill	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
WsA---------------- Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak, imperial Carolina poplar.

* 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
An: Armiesburg	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
BdA: Belmore Variant	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
BkB2*:					
Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Del Rey	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Co: Coesse	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
DeA*:					
Del Rey	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
DkA: Digby	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ee: Eel	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.
EoA: Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones, percs slowly.	Slight	Moderate: droughty.
EoB2: Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Moderate: droughty.
EpC3: Eldean	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
EsB2: Eldean Variant	Slight	Slight	Moderate: slope.	Slight	Slight.
GnB2, GpB3: Glynwood	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	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
GtA------------------- Glynwood Variant	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight----------	Slight.
HaA------------------- Haney	Moderate: wetness.	Moderate: wetness.	Moderate: small stones, wetness.	Moderate: wetness.	Moderate: wetness.
HbA------------------- Haskins Variant	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Mh, Mk---------------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mn-------------------- Millgrove	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mo-------------------- Millsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MsA------------------- Milton Variant	Severe: thin layer, area reclaim.	Severe: thin layer, area reclaim.	Severe: thin layer, area reclaim.	Slight----------	Severe: thin layer, area reclaim.
MuB2------------------ Morley	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
MuE------------------- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MvC2------------------ Morley	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight.
MxC3------------------ Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
Pg, Pk---------------- Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pm-------------------- Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Py*. Pits					
RdA------------------- Randolph	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, thin layer, area reclaim.
RlB------------------- Rawson Variant	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
RlC------------------- Rawson Variant	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Rr: Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Rz: Ross	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Se: Saranac	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Sp: Shoals	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Sv: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
TuB2: Tuscola	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
Ud. Udorthents					
Wa: Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wd: Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
WsA: Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

* 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
An----------------- Armiesburg	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
BdA---------------- Belmore Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BkB2*:										
Blount------------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Del Rey-----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Co----------------- Coesse	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
DeA*:										
Del Rey-----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Blount------------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
DkA---------------- Digby	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ee----------------- Eel	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
EoA---------------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EoB2--------------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EpC3--------------- Eldean	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
EsB2--------------- Eldean Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GnB2, GpB3--------- Glynwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GtA---------------- Glynwood Variant	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HaA---------------- Haney	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HbA---------------- Haskins Variant	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mh, Mk------------- Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mn----------------- Millgrove	Fair	Fair	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							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
Mo-----Millsdale	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair.
MsA-----Milton Variant	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
MuB2-----Morley	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MuE-----Morley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MvC2, MxC3-----Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Pg, Pk-----Pella	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Pm-----Pewamo	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
RdA-----Randolph	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RlB-----Rawson Variant	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
RlC-----Rawson Variant	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rr-----Rensselaer	Fair	Poor	Poor	Fair	Fair	Good	Good	Fair	Fair	Good.
Rz-----Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Se-----Saranac	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Sp-----Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Sv-----Sloan	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
TuB2-----Tuscola	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wa-----Wallkill	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wd-----Wallkill	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
WsA-----Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

* 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
An: Armiesburg	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
BdA: Belmore Variant	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
BkB2*:						
Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Del Rey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Co: Coesse	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
DeA*:						
Del Rey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
DkA: Digby	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Ee: Eel	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
EoA: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
EoB2: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
EpC3: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: small stones, large stones, slope.
EsB2: Eldean Variant	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	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
GnB2: Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
GpB3: Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
GtA: Glynwood Variant	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Slight.
HaA: Haney	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.
HbA: Haskins Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Mh: Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Mk: Milford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Mn: Millgrove	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Mo: Millsdale	Severe: depth to rock, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, depth to rock, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
MsA: Milton Variant	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer, area reclaim.
MuB2: Morley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
MuE: Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
MvC2: Morley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
MxC3: Morley	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	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
Pg: Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pk: Pella	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pm: Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Py*. Pits						
RdA: Randolph	Severe: depth to rock, wetness.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness, thin layer, area reclaim.
RlB: Rawson Variant	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: droughty.
RlC: Rawson Variant	Moderate: dense layer, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: droughty, slope.
Rr: Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Rz: Ross	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Se: Saranac	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Sp: Shoals	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
Sv: Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
TuB2: Tuscola	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	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
Ud. Udorthents						
Wa----------------- Wallkill	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding.
Wd----------------- Wallkill	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding.
WsA---------------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.

* 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
An: Armiesburg	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: hard to pack.
BdA: Belmore Variant	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
BkB2*:					
Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Del Rey	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Co: Coesse	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
DeA*:					
Del Rey	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
DkA: Digby	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
Ee: Eel	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
EoA, EoB2: Eldean	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EpC3: Eldean	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EsB2: Eldean Variant	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, 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
GnB2, GpB3---------- Glynwood	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
GtA----------------- Glynwood Variant	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
HaA----------------- Haney	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones.
HbA----------------- Haskins Variant	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Mh------------------ Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Mk------------------ Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Mn------------------ Millgrove	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, small stones, ponding.
Mo------------------ Millsdale	Severe: thin layer, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Severe: ponding.	Poor: area reclaim, too clayey, hard to pack.
MsA----------------- Milton Variant	Severe: thin layer, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Severe: area reclaim.
MuB2---------------- Morley	Moderate: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
MuE----------------- Morley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.
MvC2---------------- Morley	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
MxC3---------------- Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Pg------------------ Pella	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pk----------------- Pella	Severe: ponding.	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding.	Poor: too sandy, ponding.
Pm----------------- Pewamo	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Py*. Pits					
RdA---------------- Randolph	Severe: thin layer, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: wetness.	Poor: area reclaim, too clayey, hard to pack.
RlB---------------- Rawson Variant	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
RlC---------------- Rawson Variant	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Rr----------------- Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Rz----------------- Ross	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Fair: too clayey.
Se----------------- Saranac	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Sp----------------- Shoals	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Sv----------------- Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
TuB2--------------- Tuscola	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Ud. Udorthents					
Wa----------------- Wallkill	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Wd: Wallkill	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
WsA: Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: 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
An-------------------- Armiesburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BdA------------------- Belmore Variant	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BkB2*:				
Blount----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Del Rey---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Co-------------------- Coesse	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
DeA*:				
Del Rey---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Blount----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
DkA------------------- Digby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Ee-------------------- Eel	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
EoA, EoB2------------- Eldean	Good-----------------	Probable-------------	Probable-------------	Poor: small stones, area reclaim.
EpC3------------------ Eldean	Good-----------------	Probable-------------	Probable-------------	Poor: too clayey, small stones, area reclaim.
EsB2------------------ Eldean Variant	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too clayey, small stones, area reclaim.
GnB2, GpB3------------ Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
GtA------------------- Glynwood Variant	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
HaA------------------- Haney	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HbA------------------- Haskins Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Mh-------------------- Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mk-------------------- Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mn-------------------- Millgrove	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
Mo-------------------- Millsdale	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
MsA------------------- Milton Variant	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
MuB2------------------ Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MuE------------------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
MvC2, MxC3------------ Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pg-------------------- Pella	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pk-------------------- Pella	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pm-------------------- Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, wetness.
Py*. Pits				
RdA------------------- Randolph	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
RlB------------------- Rawson Variant	Fair: shrink-swell, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RlC: Rawson Variant	Fair: shrink-swell, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Rr: Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Rz: Ross	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Se: Saranac	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Sp: Shoals	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sv: Sloan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
TuB2: Tuscola	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Ud. Udorthents				
Wa: Wallkill	Poor: thin layer, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Wd: Wallkill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
WsA: Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "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-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
An-- Armiesburg	Moderate: seepage.	Moderate: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
BdA-- Belmore Variant	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
BkB2*:						
Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
Del Rey	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Co-- Coesse	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
DeA*:						
Del Rey	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
DkA-- Digby	Severe: seepage.	Severe: wetness.	Moderate: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness.
Ee-- Eel	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
EoA, EoB2-- Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily, droughty.
EpC3-- Eldean	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
EsB2-- Eldean Variant	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
GnB2, GpB3-- Glynwood	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
GtA-- Glynwood Variant	Slight	Moderate: wetness.	Severe: slow refill.	Favorable	Erodes easily, wetness.	Erodes easily.
HaA-- Haney	Severe: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness	Favorable.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
HbA: Haskins Variant	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Mh: Milford	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Mk: Milford	Moderate: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding	Wetness.
Mn: Millgrove	Severe: seepage.	Severe: ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, too sandy.	Wetness.
Mo: Millsdale	Moderate: depth to rock, seepage.	Severe: ponding.	Severe: no water.	Ponding, thin layer, frost action.	Depth to rock, area reclaim, ponding.	Wetness, depth to rock, area reclaim.
MsA: Milton Variant	Severe: depth to rock, seepage.	Severe: thin layer.	Severe: no water, depth to rock.	Thin layer	Depth to rock, area reclaim.	Depth to rock, area reclaim.
MuB2: Morley	Moderate: slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily, percs slowly.
MuE: Morley	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, percs slowly.
MvC2: Morley	Moderate: slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily, percs slowly.
MxC3: Morley	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, percs slowly.
Pg: Pella	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
Pk: Pella	Moderate: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Erodes easily, ponding, too sandy.	Wetness, erodes easily.
Pm: Pewamo	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Py*. Pits						
RdA: Randolph	Moderate: depth to rock, seepage.	Severe: thin layer.	Severe: no water.	Thin layer, frost action.	Depth to rock, area reclaim, erodes easily.	Wetness, erodes easily, depth to rock.
RlB: Rawson Variant	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Slope	Wetness, soil blowing.	Droughty.
RlC: Rawson Variant	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Slope	Slope, wetness, soil blowing.	Slope, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Rr: Rensselaer	Moderate: seepage.	Severe: thin layer, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Wetness.
Rz: Ross	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Favorable.
Se: Saranac	Slight	Severe: wetness.	Severe: slow refill.	Flooding, frost action.	Wetness	Wetness, rooting depth.
Sp: Shoals	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Sv: Sloan	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
TuB2: Tuscola	Moderate: seepage, slope.	Severe: thin layer.	Moderate: deep to water, slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
Ud. Udorthents						
Wa: Wallkill	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
Wd: Wallkill	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, subsides, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
WsA: Whitaker	Severe: seepage.	Severe: wetness, piping.	Moderate: slow refill, cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
An-----------------Armiesburg	0-20	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	20-60	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
BdA-----------------Belmore Variant	0-13	Loam----------------	CL-ML, CL	A-4, A-6	0	100	100	85-95	60-75	25-35	5-15
	13-47	Loam, sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	100	100	80-95	35-75	25-40	5-20
	47-65	Sandy loam, fine sandy loam.	SM, SC, SM-SC	A-4, A-2	0	100	90-100	55-85	30-50	<25	NP-10
	65-72	Stratified very gravelly sandy loam to loamy coarse sand.	SM, SC, SM-SC	A-2, A-1	0	80-100	55-80	35-60	20-30	<25	NP-10
BkB2*:											
Blount------------	0-9	Silt loam---------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	9-17	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
	17-23	Silty clay loam, clay loam.	CL, CH, ML, MH	A-6, A-7	0-5	95-100	90-100	80-90	70-90	35-55	10-30
	23-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
Del Rey-----------	0-9	Silt loam---------	CL	A-6, A-7	0	95-100	95-100	90-100	70-95	25-45	10-25
	9-37	Silty clay loam, silty clay.	CH, CL	A-7	0	95-100	95-100	90-100	85-95	40-55	20-30
	37-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	70-95	30-45	10-25
Co-----------------Coesse	0-22	Silt loam---------	CL	A-6	0	100	95-100	85-100	65-90	30-35	10-15
	22-32	Clay, silty clay	CL, CH	A-7	0	100	95-100	90-100	70-95	45-60	20-30
	32-57	Clay, silty clay	CL, CH	A-7	0-3	95-100	90-100	85-100	70-95	45-60	20-30
	57-65	Silty clay loam, clay loam.	CL	A-6, A-7	0-3	95-100	90-100	85-100	70-95	30-45	10-20
DeA*:											
Del Rey-----------	0-9	Silt loam---------	CL	A-6, A-7	0	95-100	95-100	90-100	70-95	25-45	10-25
	9-37	Silty clay loam, silty clay.	CH, CL	A-7	0	95-100	95-100	90-100	85-95	40-55	20-30
	37-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	70-95	30-45	10-25
Blount------------	0-9	Silt loam---------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	9-17	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
	17-23	Silty clay loam, clay loam.	CL, CH, ML, MH	A-6, A-7	0-5	95-100	90-100	80-90	70-90	35-55	10-30
	23-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25

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	
DkA-------------- Digby	0-10	Silt loam--------	SM, ML, CL-ML	A-4	0	85-100	80-100	70-90	40-80	<36	NP-10
	10-46	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	80-90	75-85	35-40	10-25
	46-58	Gravelly sandy clay loam, gravelly clay loam, gravelly loam.	CL, CL-ML, SC, SM-SC	A-6, A-4, A-1, A-2	0-5	85-100	50-80	40-75	20-60	25-40	4-15
	58-65	Stratified very gravelly sandy loam to gravelly sand.	SM, SW-SM, SP-SM	A-2, A-1	0-5	80-100	45-80	30-60	10-30	<20	NP-4
Ee--------------- Eel	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	24-40	3-15
	9-38	Silt loam, loam, clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	24-40	3-15
	38-60	Stratified sandy loam to silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	90-100	70-80	55-70	24-40	3-15
EoA, EoB2-------- Eldean	0-8	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	8-25	Clay, sandy clay, gravelly clay loam.	CL, ML	A-7, A-6	0-5	75-100	60-100	55-95	50-80	38-50	12-23
	25-38	Very gravelly clay loam, loam, gravelly sandy loam.	CL, GC, SC	A-6, A-7, A-2	0-10	55-85	45-85	45-75	30-60	38-50	12-23
	38-60	Stratified sand to extremely gravelly coarse sandy loam.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
EpC3------------- Eldean	0-8	Gravelly clay loam.	CL, SC	A-6, A-4	0-10	65-90	60-80	55-80	40-65	25-40	9-18
	8-22	Clay, sandy clay, gravelly clay loam.	CL, ML	A-7, A-6	0-5	75-100	60-100	55-95	50-80	38-50	12-23
	22-35	Very gravelly clay loam, loam, gravelly sandy loam.	CL, GC, SC	A-4, A-6, A-7, A-2	0-10	55-85	45-85	45-75	30-60	30-45	8-20
	35-60	Stratified sand to extremely gravelly coarse sandy loam.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
EsB2------------- Eldean Variant	0-10	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	10-21	Clay loam, clay	CL, CH	A-7	0	100	85-95	75-95	60-90	40-60	20-35
	21-30	Gravelly clay loam.	CL, SC	A-7	0-10	90-100	60-75	50-75	40-60	40-50	20-25
	30-60	Very gravelly coarse sandy loam, gravelly loamy coarse sand.	SM, SP-SM, SM-SC	A-2-4, A-1	0-10	80-100	35-60	20-40	5-20	<25	NP-7

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GnB2-------------- Glynwood	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	55-90	23-40	4-15
	7-22	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	22-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
GpB3-------------- Glynwood	0-5	Clay loam--------	CL	A-6, A-7	0-2	95-100	85-100	75-100	60-95	25-45	10-22
	5-20	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	20-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
GtA-------------- Glynwood Variant	0-10	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	10-29	Clay loam--------	CL	A-6, A-7	0-2	95-100	95-100	85-100	65-80	35-45	15-20
	29-48	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-45	15-20
	48-60	Clay loam--------	CL	A-6	0-5	95-100	90-100	85-100	65-80	30-40	10-15
HaA-------------- Haney	0-15	Silt loam--------	ML	A-4	0	85-100	80-95	70-90	50-80	20-36	NP-10
	15-32	Clay loam, sandy clay loam, loam.	CL, SC, ML, SM	A-6, A-4	0	80-100	75-95	55-75	40-70	25-40	3-16
	32-50	Gravelly loam, gravelly clay loam, very gravelly sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2, A-1-b	0-5	80-100	45-80	35-80	15-65	25-40	4-15
	50-80	Stratified gravelly sandy loam to gravel.	SM, SW-SM, SP-SM	A-4, A-2, A-1-b, A-1-a	0-5	80-100	45-80	25-60	10-40	<30	NP-4
HbA-------------- Haskins Variant	0-13	Loam------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	70-100	55-90	25-40	5-20
	13-37	Sandy loam, loam, clay loam.	SC, CL	A-4, A-2-4, A-6, A-2-6	0	95-100	90-100	50-95	25-75	20-30	7-12
	37-60	Clay loam, silty clay loam.	CL	A-6	0-5	95-100	95-100	85-100	65-95	30-40	10-15
Mh--------------- Milford	0-15	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	75-95	40-55	20-30
	15-57	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	57-65	Stratified clay to sandy loam.	CL, SC	A-6, A-7	0	95-100	95-100	90-100	45-100	25-50	10-30
Mk--------------- Milford	0-14	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	85-95	35-45	15-25
	14-48	Silty clay loam, clay loam.	CL	A-7	0	100	95-100	85-100	60-95	40-50	20-30
	48-58	Stratified silty clay loam to sandy loam.	CL	A-6, A-7, A-4	0	95-100	90-100	60-95	60-80	25-45	7-25
	58-65	Stratified silt loam to sand.	CL-ML, CL	A-4, A-6	0	95-100	90-100	50-95	50-80	20-30	7-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mn------------ Millgrove	0-14	Clay loam--------	CL, ML	A-4, A-6, A-7	0	85-100	80-100	70-100	55-80	25-45	7-16
	14-37	Clay loam, sandy clay loam, loam.	CL, SC	A-6	0	85-100	80-100	70-95	40-75	25-40	11-26
	37-52	Gravelly loam, very gravelly sandy loam, gravelly clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2, A-1	0-5	60-100	35-85	25-80	15-60	25-40	4-15
	52-60	Stratified very gravelly loam to fine sand.	SM, ML, GM, GM-GC	A-2, A-4	0-5	60-100	35-85	30-70	25-55	15-35	NP-10
Mo------------ Millsdale	0-13	Silty clay loam	CL	A-6, A-7	0	90-100	80-100	75-100	70-95	32-50	12-25
	13-26	Clay, silty clay loam, clay loam.	CH, CL	A-7	0-5	85-100	80-100	75-100	60-95	40-60	20-35
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MsA------------ Milton Variant	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	65-90	25-35	5-15
	13-18	Clay------------	CH, CL	A-7	0-5	100	90-100	80-100	65-95	40-60	25-35
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MuB2------------ Morley	0-9	Loam------------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	9-25	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	25-34	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-35
	34-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
MuE------------ Morley	0-9	Loam------------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	9-18	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	18-30	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-35
	30-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
MvC2------------ Morley	0-9	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	9-18	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	18-30	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-35
	30-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
MxC3------------ Morley	0-6	Clay loam--------	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	6-13	Silty clay, clay loam, clay.	CL, CH	A-7	0-10	95-100	90-100	85-95	80-90	40-60	15-35
	13-17	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	15-30
	17-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30

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	
Pg--------------- Pella	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	15-25
	10-55	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	30-50	11-26
	55-60	Silty clay loam	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-95	30-45	10-24
Pk--------------- Pella	0-10	Mucky silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	10-20	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	20-38	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	85-95	25-40	10-20
	38-60	Stratified silt loam to sand.	SM, SC, ML, CL	A-4, A-6	0	85-100	80-100	45-100	35-70	<30	2-12
Pm--------------- Pewamo	0-10	Silty clay loam	CL	A-6, A-7	0-5	90-100	75-100	75-100	70-90	35-50	15-25
	10-55	Clay loam, clay, silty clay.	CL, CH	A-7	0-5	95-100	75-100	75-100	75-95	40-55	20-35
	55-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	75-100	75-100	70-90	40-50	15-25
RdA-------------- Randolph	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	75-85	20-38	4-15
	9-20	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0-5	75-95	75-95	75-85	70-80	35-60	14-32
	20-25	Clay loam, gravelly sandy clay loam, sandy loam.	CL, SM-SC, SC, GM-GC	A-2, A-4, A-6	0-15	55-80	40-75	35-65	20-60	20-40	5-20
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RlB, RlC--------- Rawson Variant	0-7	Fine sandy loam	SC, SM-SC, CL, CL-ML	A-4	0	100	95-100	70-85	40-75	20-30	4-10
	7-14	Loam, fine sandy loam.	SC, CL, CL-ML, SM-SC	A-6, A-4	0	100	90-100	60-95	35-75	25-35	5-15
	14-42	Clay loam, sandy clay loam.	CL, SC	A-6, A-2-6, A-2-7, A-7	0-5	95-100	95-100	75-100	30-80	30-45	10-25
	42-48	Clay loam--------	CL	A-7	0-5	95-100	95-100	85-100	65-80	40-50	15-25
	48-60	Clay loam--------	CL	A-7, A-6	0-5	95-100	95-100	85-100	65-80	35-45	15-25
Rr--------------- Rensselaer	0-16	Loam-------------	CL, ML, CL-ML	A-4, A-6	0	95-100	90-100	80-100	55-90	15-35	4-15
	16-25	Clay loam, silty clay loam, loam.	CL	A-6, A-4	0	95-100	90-100	80-100	50-95	25-40	8-20
	25-43	Sandy clay loam, loam, sandy loam.	CL, SC	A-6, A-4, A-2-4, A-2-6	0	95-100	90-100	55-100	25-65	25-35	8-15
	43-60	Stratified fine sand to silt loam.	CL, SC, ML, SM	A-4, A-2	0	95-100	90-100	45-95	25-85	<25	2-10

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	
Rz----------------- Ross	0-17	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	17-50	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
	50-60	Stratified gravelly sandy loam to silt loam.	CL, ML, SM, GM	A-6, A-4, A-2	0-5	65-100	45-100	30-100	25-80	<30	NP-12
Se----------------- Saranac	0-10	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-95	30-50	15-25
	10-55	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	70-90	45-65	20-40
	55-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	70-90	45-65	20-40
Sp----------------- Shoals	0-10	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	20-35	6-15
	10-39	Silt loam, loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	5-15
	39-60	Stratified silt loam to sandy loam.	ML, CL, CL-ML	A-4	0-3	90-100	85-100	60-80	50-70	<30	4-10
Sv----------------- Sloan	0-11	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	65-95	35-45	12-20
	11-54	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	54-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
TuB2--------------- Tuscola	0-11	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	100	90-100	75-95	50-70	25-35	5-15
	11-36	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	100	85-100	65-100	40-75	35-45	15-25
	36-42	Silt loam---------	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	70-90	25-35	5-15
	42-60	Fine sandy loam	SM, ML	A-4	0	100	90-100	60-85	35-55	<20	NP-3
Wa----------------- Wallkill	0-8	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	8-17	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	70-95	30-45	10-20
	17-41	Sapric material	PT	A-8	0	---	---	---	---	---	---
	41-60	Coprogenous earth	CL, CH	A-6, A-7	0	100	100	95-100	80-100	30-60	15-30
Wd----------------- Wallkill	0-8	Silt loam---------	ML, CL-ML, CL	A-4, A-6	0	95-100	90-100	75-100	60-85	16-32	3-12
	8-18	Silt loam, loam, mucky silt loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-100	60-85	20-34	6-13
	18-60	Sapric material, hemic material.	PT, OH	A-8	0	---	---	---	---	---	---
WsA---------------- Whitaker	0-11	Silt loam---------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	60-90	15-35	2-15
	11-41	Clay loam, silty clay loam, sandy clay loam.	CL, CL-ML	A-6, A-4	0	100	95-100	80-100	60-80	20-35	5-15
	41-60	Stratified coarse sand to silt loam.	ML, SM, CL-ML, SM-SC	A-4	0	98-100	98-100	60-85	40-60	<25	NP-7

* 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
An---------------- Armiesburg	0-20	27-35	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	7	2-4
	20-60	30-35	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
BdA--------------- Belmore Variant	0-13	15-22	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.28	5	5	2-4
	13-47	18-30	1.45-1.60	2.0-6.0	0.16-0.19	5.1-7.3	Low-----------	0.28			
	47-65	10-20	1.50-1.60	2.0-6.0	0.12-0.17	5.6-7.8	Low-----------	0.28			
	65-72	7-15	1.65-1.75	6.0-20	0.08-0.10	7.4-8.4	Low-----------	0.15			
BkB2*:											
Blount-----------	0-9	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	6	2-3
	9-17	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	17-23	27-38	1.50-1.70	0.06-0.6	0.12-0.19	6.1-7.8	Moderate-----	0.43			
	23-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
Del Rey----------	0-9	15-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	6	2-3
	9-37	35-45	1.40-1.65	0.06-0.2	0.12-0.20	4.5-8.4	Moderate-----	0.43			
	37-60	25-35	1.50-1.70	0.06-0.2	0.09-0.11	7.9-8.4	Moderate-----	0.43			
Co---------------- Coesse	0-22	22-27	1.30-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.37	5	6	1-3
	22-32	45-55	1.40-1.65	0.2-0.6	0.09-0.13	6.1-7.3	Moderate-----	0.37			
	32-57	40-55	1.40-1.70	0.2-0.6	0.09-0.13	6.1-7.3	Moderate-----	0.37			
	57-65	27-40	1.40-1.85	0.2-0.6	0.10-0.18	6.1-8.4	Moderate-----	0.37			
DeA*:											
Del Rey----------	0-9	15-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	6	2-3
	9-37	35-45	1.40-1.65	0.06-0.2	0.12-0.20	4.5-8.4	Moderate-----	0.43			
	37-60	25-35	1.50-1.70	0.06-0.2	0.09-0.11	7.9-8.4	Moderate-----	0.43			
Blount-----------	0-9	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	6	2-3
	9-17	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	17-23	27-38	1.50-1.70	0.06-0.6	0.12-0.19	6.1-7.8	Moderate-----	0.43			
	23-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
DkA--------------- Digby	0-10	12-20	1.20-1.40	0.6-2.0	0.16-0.22	5.6-7.3	Low-----------	0.32	4	5	2-4
	10-46	35-40	1.45-1.70	0.6-2.0	0.12-0.16	4.5-7.8	Low-----------	0.32			
	46-58	18-35	1.40-1.60	0.6-2.0	0.08-0.15	6.1-7.8	Low-----------	0.32			
	58-65	3-15	1.25-1.55	6.0-20	0.02-0.09	7.4-8.4	Low-----------	0.10			
Ee---------------- Eel	0-9	18-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	5	1-2
	9-38	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-7.8	Low-----------	0.37			
	38-60	10-27	1.30-1.50	0.6-2.0	0.19-0.21	6.1-8.4	Low-----------	0.37			
EoA, EoB2--------- Eldean	0-8	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
	8-25	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate-----	0.37			
	25-38	25-45	1.30-1.60	0.6-2.0	0.07-0.14	6.6-8.4	Low-----------	0.37			
	38-60	2-8	1.55-1.70	>6.0	0.01-0.04	7.4-8.4	Low-----------	0.10			
EpC3-------------- Eldean	0-8	27-33	1.35-1.55	0.6-2.0	0.11-0.15	5.6-7.3	Moderate-----	0.24	3	8	.5-2
	8-22	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate-----	0.37			
	22-35	25-45	1.30-1.60	0.6-2.0	0.07-0.14	6.6-8.4	Low-----------	0.37			
	35-60	2-8	1.55-1.70	>6.0	0.01-0.04	7.4-8.4	Low-----------	0.10			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
EsB2 Eldean Variant	0-10	18-26	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	4	5	1-3
	10-21	35-50	1.45-1.60	0.6-2.0	0.09-0.19	6.1-7.3	Moderate	0.37			
	21-30	35-40	1.55-1.70	0.6-2.0	0.12-0.16	6.6-7.8	Moderate	0.28			
	30-60	4-15	1.60-1.70	6.0-20	0.06-0.10	7.4-8.4	Low	0.15			
GnB2 Glynwood	0-7	16-27	1.25-1.50	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.43	3	6	1-3
	7-22	35-55	1.45-1.70	0.06-0.2	0.11-0.18	4.5-7.8	Moderate	0.32			
	22-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate	0.32			
GpB3 Glynwood	0-5	27-38	1.35-1.55	0.2-0.6	0.17-0.23	5.1-7.3	Low	0.43	2	7	1-2
	5-20	35-55	1.45-1.70	0.06-0.2	0.11-0.18	4.5-7.8	Moderate	0.32			
	20-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate	0.32			
GtA Glynwood Variant	0-10	20-27	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	6	1-3
	10-29	35-40	1.40-1.55	0.2-0.6	0.15-0.19	5.6-7.3	Moderate	0.37			
	29-48	32-38	1.50-1.60	0.2-0.6	0.15-0.19	5.6-7.8	Moderate	0.37			
	48-60	27-32	1.60-1.75	0.2-0.6	0.04-0.10	7.4-8.4	Moderate	0.37			
HaA Haney	0-15	12-20	1.30-1.50	0.6-2.0	0.16-0.22	5.6-7.3	Low	0.32	4	5	1-3
	15-32	20-35	1.25-1.60	0.6-2.0	0.10-0.16	4.5-7.8	Low	0.32			
	32-50	20-35	1.25-1.60	0.6-2.0	0.08-0.15	6.1-7.8	Low	0.32			
	50-80	3-15	1.25-1.55	6.0-20	0.02-0.08	7.4-8.4	Low	0.24			
HbA Haskins Variant	0-13	12-20	1.30-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	4	5	1-4
	13-37	18-30	1.40-1.55	0.6-2.0	0.13-0.17	5.1-7.3	Low	0.32			
	37-60	28-35	1.40-1.65	0.06-0.2	0.13-0.17	6.6-8.4	Moderate	0.32			
Mh Milford	0-15	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
	15-57	35-42	1.40-1.60	0.2-0.6	0.18-0.20	5.6-7.8	Moderate	0.43			
	57-65	20-30	1.50-1.70	0.2-0.6	0.20-0.22	6.6-8.4	Moderate	0.43			
Mk Milford	0-14	30-40	1.35-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate	0.28	5	4	4-6
	14-48	35-40	1.40-1.60	0.2-0.6	0.15-0.20	5.6-7.3	Moderate	0.28			
	48-58	18-35	1.50-1.60	0.2-0.6	0.15-0.21	6.6-7.8	Moderate	0.28			
	58-65	10-22	1.50-1.60	0.6-2.0	0.18-0.22	7.4-8.4	Low	0.28			
Mn Millgrove	0-14	27-32	1.35-1.55	0.6-2.0	0.16-0.19	5.6-7.3	Moderate	0.24	4	6	3-8
	14-37	18-35	1.40-1.70	0.6-2.0	0.12-0.16	6.1-7.8	Moderate	0.28			
	37-52	15-30	1.25-1.60	0.6-2.0	0.08-0.15	6.1-7.8	Low	0.20			
	52-60	5-18	1.25-1.60	2.0-6.0	0.08-0.12	7.4-8.4	Low	0.28			
Mo Millsdale	0-13	27-32	1.30-1.50	0.6-2.0	0.17-0.22	6.1-7.3	Moderate	0.28	4	7	4-7
	13-26	35-45	1.40-1.65	0.2-0.6	0.12-0.16	6.1-8.4	High	0.32			
	26	---	---	---	---	---	-------------	----			
MsA Milton Variant	0-13	18-27	1.30-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low	0.32	2	6	2-4
	13-18	40-50	1.35-1.50	0.2-0.6	0.10-0.13	6.1-7.3	Moderate	0.32			
	18	---	---	---	---	---	-------------	----			
MuB2 Morley	0-9	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.43	4	6	1-3
	9-25	27-40	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.5	Moderate	0.43			
	25-34	35-50	1.55-1.70	0.2-0.6	0.11-0.15	6.1-8.4	Moderate	0.43			
	34-60	27-40	1.60-1.80	0.2-0.6	0.07-0.12	6.1-8.4	Moderate	0.43			
MuE, MvC2 Morley	0-9	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low	0.43	4	6	1-3
	9-18	27-40	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.5	Moderate	0.43			
	18-30	35-50	1.55-1.70	0.06-0.6	0.11-0.15	6.1-8.4	Moderate	0.43			
	30-60	27-40	1.60-1.80	0.06-0.6	0.07-0.12	6.1-8.4	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
MxC3-------------- Morley	0-6	27-40	1.45-1.65	0.2-0.6	0.17-0.19	5.1-6.5	Moderate-----	0.32	3	6	1-3
	6-13	35-50	1.55-1.70	0.2-0.6	0.11-0.15	6.1-7.8	Moderate-----	0.32			
	13-17	27-50	1.60-1.70	0.06-0.6	0.07-0.12	6.1-8.4	Moderate-----	0.43			
	17-60	27-40	1.60-1.70	0.06-0.6	0.07-0.12	6.1-8.4	Moderate-----	0.43			
Pg---------------- Pella	0-10	27-35	1.35-1.50	0.6-2.0	0.21-0.23	6.6-7.3	Moderate-----	0.28	5	7	1-3
	10-55	27-40	1.40-1.55	0.2-0.6	0.18-0.20	6.6-7.3	Moderate-----	0.28			
	55-60	27-35	1.40-1.55	0.2-0.6	0.18-0.20	7.4-8.4	Moderate-----	0.28			
Pk---------------- Pella	0-10	27-40	1.20-1.30	0.6-2.0	0.23-0.25	6.1-7.8	Moderate-----	0.28	5	7	8-14
	10-20	24-40	1.40-1.60	0.6-2.0	0.18-0.22	6.6-7.8	Moderate-----	0.43			
	20-38	15-30	1.35-1.60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.43			
	38-60	7-24	1.50-1.75	0.6-2.0	0.06-0.20	7.4-8.4	Low----------	0.43			
Pm---------------- Pewamo	0-10	27-40	1.35-1.55	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.28	5	7	3-12
	10-55	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.32			
	55-60	30-40	1.50-1.70	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.37			
Py*. Pits											
RdA--------------- Randolph	0-9	16-27	1.30-1.45	0.6-2.0	0.17-0.22	5.1-7.3	Low----------	0.37	4	6	1-3
	9-20	35-50	1.40-1.65	0.2-0.6	0.13-0.16	5.1-7.8	Moderate-----	0.37			
	20-25	18-36	1.50-1.70	0.2-0.6	0.04-0.11	7.4-8.4	Low----------	0.37			
	25	---	---	---	---	---	-------------	----			
RlB, RlC---------- Rawson Variant	0-7	12-18	1.35-1.45	0.6-2.0	0.16-0.22	6.1-7.3	Low----------	0.24	5	3	1-2
	7-14	15-27	1.45-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Low----------	0.32			
	14-42	25-35	1.50-1.70	0.6-2.0	0.04-0.10	5.6-7.3	Moderate-----	0.32			
	42-48	30-40	1.60-1.80	0.2-0.6	0.14-0.16	7.4-7.8	Moderate-----	0.32			
	48-60	27-35	1.70-1.90	0.06-0.2	0.04-0.10	7.4-8.4	Moderate-----	0.32			
Rr---------------- Rensselaer	0-16	11-27	1.30-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low----------	0.32	5	5	2-8
	16-25	20-35	1.40-1.60	0.6-2.0	0.15-0.20	6.1-7.3	Moderate-----	0.32			
	25-43	20-30	1.40-1.60	0.6-2.0	0.16-0.19	6.6-7.8	Moderate-----	0.32			
	43-60	8-20	1.50-1.70	0.6-2.0	0.10-0.18	6.6-8.4	Low----------	0.43			
Rz---------------- Ross	0-17	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	Low----------	0.32	5	5	3-5
	17-50	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.1-8.4	Low----------	0.32			
	50-60	5-25	1.35-1.60	0.6-6.0	0.05-0.18	6.1-8.4	Low----------	0.32			
Se---------------- Saranac	0-10	27-40	1.30-1.50	0.2-0.6	0.20-0.24	6.1-7.8	Moderate-----	0.28	5	7	4-6
	10-55	35-60	1.40-1.70	0.2-0.6	0.10-0.20	6.1-7.8	Moderate-----	0.32			
	55-60	35-60	1.50-1.75	0.2-0.6	0.10-0.20	6.6-8.4	Moderate-----	0.32			
Sp---------------- Shoals	0-10	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.37	5	6	2-5
	10-39	18-33	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	Low----------	0.37			
	39-60	12-25	1.35-1.60	0.6-2.0	0.12-0.21	6.1-8.4	Low----------	0.37			
Sv---------------- Sloan	0-11	27-33	1.25-1.50	0.6-2.0	0.20-0.23	6.1-7.8	Moderate-----	0.28	5	7	3-6
	11-54	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37			
	54-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low----------	0.37			
TuB2-------------- Tuscola	0-11	18-26	1.30-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	5	1-2
	11-36	25-35	1.45-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.32			
	36-42	14-26	1.50-1.60	0.6-2.0	0.20-0.22	6.6-7.8	Low----------	0.43			
	42-60	5-10	1.60-1.70	0.6-2.0	0.14-0.16	7.4-8.4	Low----------	0.24			
Ud. Udorthents											

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
Wa----------------	0-8	20-27	1.30-1.40	0.6-2.0	0.22-0.24	4.5-8.4	Low-----------	0.32	5	5	1-6
Wallkill	8-17	27-40	1.40-1.60	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.37			
	17-41	---	0.10-0.30	2.0-6.0	0.35-0.45	5.1-7.3	-------------	----			
	41-60	18-35	0.30-1.10	0.06-0.2	0.18-0.24	5.1-8.4	Moderate-----	0.28			
Wd----------------	0-8	10-27	1.15-1.40	0.6-2.0	0.16-0.21	5.1-7.8	Low-----------	0.37	5	8	3-8
Wallkill	8-18	15-27	1.15-1.40	0.6-2.0	0.15-0.20	5.1-7.8	Low-----------	0.32			
	18-60	---	0.25-0.45	2.0-6.0	0.35-0.45	5.6-7.8	-------------	----			
WsA---------------	0-11	8-19	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
Whitaker	11-41	18-33	1.40-1.60	0.6-2.0	0.15-0.19	5.1-8.4	Moderate-----	0.37			
	41-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.1-8.4	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 "frequent," "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				
An----------------- Armiesburg	B	Frequent----	Brief-----	Oct-Jun	>6.0	---	---	>60	---	High-----	Moderate	Low.
BdA---------------- Belmore Variant	B	Frequent----	Brief-----	Oct-Apr	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
BkB2*:												
Blount-----------	C	None--------	---	---	1.0-3.0	Perched	Jan-May	>60	---	High-----	High-----	High.
Del Rey----------	C	None--------	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High-----	High-----	Moderate.
Co----------------- Coesse	C/D	None--------	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Low.
DeA*:												
Del Rey----------	C	None--------	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High-----	High-----	Moderate.
Blount-----------	C	None--------	---	---	1.0-3.0	Perched	Jan-May	>60	---	High-----	High-----	High.
DkA---------------- Digby	B	None--------	---	---	1.0-2.5	Apparent	Jan-Apr	>60	---	High-----	Moderate	High.
Ee----------------- Eel	B	Frequent----	Brief-----	Oct-Jun	1.5-3.0	Apparent	Jan-Apr	>60	---	High-----	Moderate	Low.
EoA, EoB2, EpC3--- Eldean	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
EsB2--------------- Eldean Variant	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
GnB2, GpB3--------- Glynwood	C	None--------	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
GtA---------------- Glynwood Variant	C	None--------	---	---	2.0-3.5	Apparent	Dec-May	>60	---	Moderate	High-----	Moderate.
HaA---------------- Haney	B	None--------	---	---	1.5-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
HbA: Haskins Variant	C	None	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
Mh: Milford	B/D	None	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High	High	Low.
Mk: Milford	B/D	None	---	---	+.5-1.0	Apparent	Dec-Jun	>60	---	High	High	Low.
Mn: Millgrove	B/D	None	---	---	+1-1.0	Apparent	Nov-May	>60	---	High	High	Low.
Mo: Millsdale	B/D	None	---	---	+1-1.0	Perched	Jan-Apr	20-40	Hard	High	High	Low.
MsA: Milton Variant	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	High	Low.
MuB2, MuE, MvC2, MxC3: Morley	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Pg: Pella	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Pk: Pella	B/D	None	---	---	+.5-1.0	Apparent	Oct-Jun	>60	---	High	High	Low.
Pm: Pewamo	C/D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Py*. Pits												
RdA: Randolph	C	None	---	---	1.0-2.5	Perched	Jan-Apr	20-40	Hard	High	High	Moderate.
RlB, RlC: Rawson Variant	B	None	---	---	2.5-4.0	Perched	Dec-May	>60	---	Moderate	Moderate	Low.
Rr: Rensselaer	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	Moderate	Low.
Rz: Ross	B	Frequent	Very brief to brief.	Nov-Jun	4.0-6.0	Apparent	Feb-Apr	>60	---	Moderate	Low	Low.

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				
Se----------------- Saranac	C/D	Frequent----	Very long	Nov-Apr	0-1.0	Apparent	Oct-May	>60	---	High-----	High-----	Low.
Sp----------------- Shoals	C	Frequent----	Brief-----	Oct-Jun	0.5-1.5	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Sv----------------- Sloan	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
TuB2--------------- Tuscola	B	None--------	---	---	2.0-3.5	Apparent	Nov-Apr	>60	---	High-----	Moderate	Low.
Ud. Udorthents												
Wa----------------- Wallkill	C/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
Wd----------------- Wallkill	B/D	None--------	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High-----	Moderate	Moderate.
WsA---------------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--ENGINEERING INDEX TEST DATA

(MAX means maximum dry density; OPT, optimum moisture; LL, liquid limit; PI, plasticity index; and UN, Unified)

Soil name and location	Parent material	Report number S84-IN-179	Depth	Moisture density MAX	Moisture density OPT	Percentage passing sieve-- No. 4	No. 10	No. 40	No. 200	Percentage smaller than-- 0.05 mm	0.02 mm	0.005 mm	0.002 mm	LL	PI	Classification AASHTO	Classification UN
			In	Lb/ cu ft	Pct									Pct			
Blount silt loam:	Clay loam																
1,480 feet east	glacial till.	1-1	0-9	107	18	100	100	99	88	87	76	69	19	31	10	A-4	CL
and 75 feet		1-3	12-19	102	22	99	99	95	79	77	59	38	41	49	25	A-7	CL
north of the southwest corner of sec. 3, T. 28 N., R. 11 E.		1-6	30-60	111	17	99	98	93	80	78	63	50	30	35	15	A-6	CL
Del Rey silt loam:	Silty																
1,560 feet	lacustrine	2-1	0-9	107	18	100	100	99	94	94	88	70	24	34	13	A-6	CL
north and 440	sediments.	2-3	13-20	104	21	100	100	100	96	96	92	56	41	55	31	A-7	CH
feet east of the southwest corner of sec. 3, T. 27 N., R. 12 E.		2-7	48-60	114	16	100	99	97	89	88	78	66	23	30	12	A-6	CL
Glynwood silt loam:	Silty clay																
1,551 feet	loam glacial	3-1	0-7	106	18	100	100	99	85	85	71	58	28	33	13	A-6	CL
west and 2,475	till.	3-3	11-16	101	22	99	99	97	85	84	70	38	47	50	26	A-7	CL
feet south of the northeast corner of sec. 21, T. 28 N., R. 12 E.		3-5	22-60	115	15	99	99	97	87	86	75	64	23	27	8	A-4	CL
Pewamo silty clay loam:	Silty or																
1,419 feet	clayey	8-1	0-10	98	22	100	100	98	90	89	80	55	34	43	17	A-7	CL
east and 264	sediments	8-3	19-26	107	18	99	99	98	91	90	82	55	36	45	23	A-7	CL
feet north of the southwest corner of sec. 5, T. 28 N., R. 12 E.	over silty clay loam glacial till.	8-8	68-80	112	17	97	96	92	79	75	62	47	32	31	11	A-6	CL

TABLE 20.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
*Armiesburg	Fine-silty, mixed, mesic Fluventic Hapludolls
Belmore Variant	Fine-loamy, mixed, mesic Typic Hapludolls
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Coesse	Fine, mixed, nonacid, mesic Aeric Fluvaquents
Del Rey	Fine, illitic, mesic Aeric Ochraqualfs
*Digby	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Eel	Fine-loamy, mixed, nonacid, mesic Aquic Udifluvents
Eldean	Fine, mixed, mesic Typic Hapludalfs
Eldean Variant	Clayey over loamy-skeletal, mixed, mesic Typic Hapludalfs
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Glynwood Variant	Fine, illitic, mesic Typic Hapludalfs
*Haney	Fine-loamy, mixed, mesic Aquic Hapludalfs
Haskins Variant	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Milford	Fine, mixed, mesic Typic Haplaquolls
*Millgrove	Fine-loamy, mixed, mesic Typic Argiaquolls
Millsdale	Fine, mixed, mesic Typic Argiaquolls
Milton Variant	Fine, mixed, mesic Lithic Argiudolls
Morley	Fine, illitic, mesic Typic Hapludalfs
Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Pewamo	Fine, mixed, mesic Typic Argiaquolls
Randolph	Fine, mixed, mesic Aeric Ochraqualfs
Rawson Variant	Fine-loamy, mixed, mesic Typic Hapludalfs
Rensselaer	Fine-loamy, mixed, mesic Typic Argiaquolls
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Saranac	Fine, mixed, mesic Fluvaquentic Haplaquolls
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Tuscola	Fine-loamy, mixed, mesic Aquic Hapludalfs
Udorthents	Loamy, mesic Udorthents
Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs

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