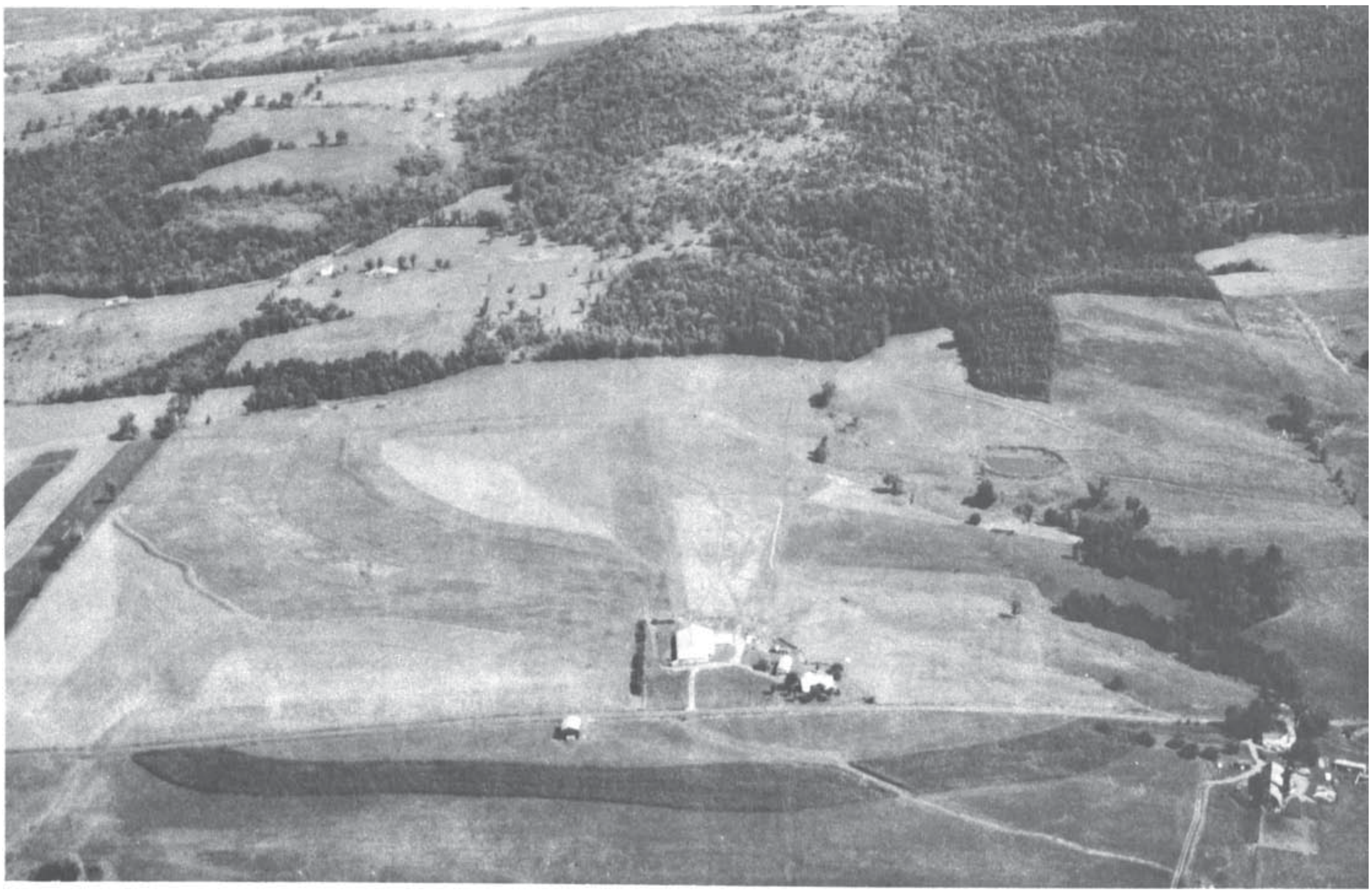
SOIL SURVEY OF

Herkimer County, New York, Southern Part



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Cornell University Agricultural Experiment Station

Major fieldwork for this soil survey was done in the period 1960–1968. Soil names and descriptions were approved in 1969. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1969. This survey was made cooperatively by the Soil Conservation Service and the Cornell University Agricultural Experiment Station as part of the technical assistance furnished to the Herkimer County Soil and Water Conservation District. This survey was partly financed by funds provided by the Herkimer County legislature through the Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartogaphic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of the southern part of Herkimer County, New York, contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in judging the suitability of tracts of land for farming, forestry, industry, urban uses, or recreation.

Locating Soils

All the soils in the survey area are shown on the detailed map at the back of this survey. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all the soils of the area and the number of the page on which each is described. It also lists, for each soil, the capability unit and the woodland suitability group in which the soil has been placed. Readers will want to refer to different parts of the survey, according to their special interests.

Newcomers in Herkimer County, Southern Part, may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and the discussions of the capability units.

Foresters and others can refer to the section "Use of the Soils for Woodland," where the soils are grouped according to their suitability for trees.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the section "Wildlife."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Use of the Soils for Town and Country Planning."

Scientists and others can read about how the soils formed and how they are classified in the section "Formation, Morphology, and Classification of the Soils."

Cover: **Aerial view of characteristic upland landscape in Herkimer County. The cultivated areas are mainly Mohawk and Burdett soils. This area is near Little Falls. (Photo courtesy of J. Joseph Brown, County Cooperative Extension Agent, and John Leitz, Jr. and Edward Hayes, Highland Airport.)**

Contents

Issued May 1975

SOIL SURVEY OF HERKIMER COUNTY, NEW YORK, SOUTHERN PART

BY ARTHUR D. KUHL, ALLAN B. TALLARICO, VAL J. KRAWIECKI, AND WILLIAM L. SHELTON, SOIL CONSERVATION SERVICE [1]

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

HERKIMER COUNTY is in the east-central part of New York State (fig. 1). It extends from St. Lawrence County on the north to Otsego County on the south and contains 922,880 acres, or 1,442 square miles. The area surveyed for this report is mainly south of the Adirondack State Park boundary, east of Utica, and contains 340,300 acres, or 532 square miles. The survey area is bounded by Fulton and Montgomery Counties on the east, Otsego County on the south, Otsego and Oneida Counties on the west, and the unsurveyed part of Herkimer County on the north. Herkimer, the county seat, is 12 miles east of Utica, the closest large city. City of New York is 170 miles southeast, and Albany, the State capital, is 70 miles east of Herkimer.

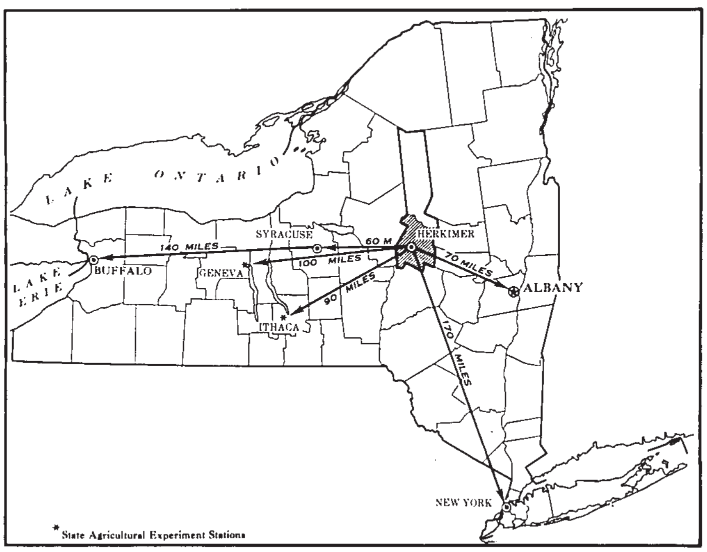


Figure 1.—**Location of Herkimer County, Southern Part, in New York.**

Most of the survey area is farmland, and dairying is the dominant type of farming. A large amount of fluid milk goes to metropolitan New York City and to New Jersey. The main crops are those grown to feed dairy cattle, such as corn for silage and grain, oats, barley, and grass and legume hay. Some vegetables are grown in the valley areas for sale on the local markets.

About 23 percent of the area is wooded. Some of this acreage is in pasture but most of it is not. Wood is harvested and sold to the numerous wood-using industries scattered throughout the valleys.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Herkimer County, Southern Part, where they are located, and how they can be used. The soil scientists went into the survey area knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Honeoye and Hartland, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such

[1] Others who participated in the field survey are: L. W. KICK, L. MCDOWELL, C. H. MAIN, B. R. LAUX, C. E. FURBUSH, N. B. HULBURT, and R. WORK, Soil Conservation Service.

differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Honeoye silt loam, 3 to 8 percent slopes, is one of several phases within the Honeoye series.

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

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planing the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Herkimer County, Southern Part: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. The Hartland-Agawam complex, 3 to 8 percent slopes, is an example.

An undifferentiated group is made of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Honeoye and Lansing silt loams, 25 to 35 percent slopes, is an undifferentiated soil group in this survey area.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Alluvial land is a land type in this survey area.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations of the area surveyed in Herkimer County. A soil association is a landscape that has a distinctive proportional pattern of soils. It consists of one or more major soils and several minor soils, and is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A general soil map showing a soil association is useful to people who want a general idea of the soils in a survey area or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and in other characteristics that affect management.

The soil associations in this survey have been grouped into six general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in each group are described in the following pages. The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 1, the term "medium-textured" refers to the texture of the surface layer.

Deep Soils Formed in Noncalcareous Glacial Till; on Uplands

These associations occupy the dissected glacial till plain along the northern fringe of the survey area. The soils formed in deep deposits of noncalcareous glacial till that ranges from medium to coarse in texture. Stones and boulders are common in places. The soils are gently sloping to moderately steep in most areas. Most of the acreage of these associations is used for dairy farming or is wooded, but some areas are idle.

1. Mosherville-Broadalbin association

Deep, somewhat poorly drained to well-drained, medium-textured soils that have a fragipan

This association covers about 1 percent of the survey area and is on uplands north of the village of Poland. The soils are gently sloping to moderately steep.

Mosherville soils make up about 50 percent of this association; Broadalbin soils, about 20 percent; and minor soils, about 30 percent. Mosherville and Broadalbin soils are medium textured and formed in firm, noncalcareous glacial till.

Mosherville soils are deep and somewhat poorly drained. They have a fragipan at a depth of 14 to 30 inches. They are on lower, wetter positions than the Broadalbin soils.

Broadalbin soils are deep and well drained to moderately well drained. They have a fragipan at a depth of 18 to 36 inches. Broadalbin soils are on the higher, better drained positions above the Mosherville soils.

Among the minor soils are Sun, Lansing, Conesus, Manheim, and Hinckley soils. Sun soils are wetter and occupy low spots and depressions; Lansing, Conesus, and Manheim soils have finer textured subsoils and lack fragipans; and Hinckley soils are gravelly and coarse textured and occupy outwash terraces.

This association is mostly in farms where the slopes are more gentle and in forests where the slopes are steeper. The major soils of this association have a fragipan in the subsoil that restricts moisture movement and root penetration and may cause droughtiness during dry seasons. Drainage of the Mosherville soils is needed to improve crop growth. Dairying is the principal type of farming in the area.

The fragipan in the subsoil and the firm glacial till substratum limit the use of these soils for septic-tank filter fields. Wetness in places limits the building of houses with basements. The firm glacial till substratum supports most structures.

The wet soils in this association need to be drained before they are suitable for most recreation uses. Excessive slope in some areas limits the use of the soils for recreation.

2. *Broadalbin-Canton association*

Deep, well drained and moderately well drained, medium-textured soils that have a fragipan, and well-drained, medium-textured soils that have a coarse-textured substratum

This association covers about 4 percent of the survey area and is on uplands near the Adirondack State Park. The soils are gently sloping to moderately steep.

Broadalbin soils make up about 50 percent of this association; Canton soils, about 11 percent; and minor soils, about 39 percent.

Broadalbin soils are deep, well drained to moderately well drained, and medium textured. They formed in firm, noncalcareous glacial till. They have a fragipan at a depth of 18 to 36 inches.

Canton soils are deep, well drained, stony, and medium textured. They formed in contrasting deposits of noncalcareous glacial till. They are medium textured to moderately coarse textured in the upper part of the profile and sandy or very gravelly and sandy below. Canton soils lack a fragipan.

Among the minor soils are Mosherville, Massena, Sun, and Mohawk soils. Mosherville, Massena, and Sun soils are wetter and occupy foot slopes and low areas and depressions. Mohawk soils are well drained to moderately well drained and are in areas dominated by silty, black shale.

The soils of this association are mostly in farms, are wooded, or are idle. A short growing season, caused by the 1,500-foot elevation where most of the acreage of this association is, has resulted in the abandonment of some areas for farming. Areas of Broadalbin soils tend to be droughty during dry periods. In places the major soils of this association need to be cleared of scattered stones before they can be farmed efficiently. Dairying is the principal type of farming in the area.

The Broadalbin soils in this association have fragipans that limit their use for septic-tank filter fields. Most of the soils will support buildings, but onsite investigation is necessary before building heavy structures. Slope imposes limitations, in places, for some urban uses.

The major soils in this association are suited to many recreational uses, but moderately steep areas limit some recreational use.

Deep Soils Formed in Calcareous Glacial Till; on Uplands

These associations occupy dissected glacial till plains both north and south of the Mohawk River. The soils formed in deep deposits of medium-textured, calcareous glacial till. They are nearly level to moderately steep in most places, but they are steep along the deeper dissections and escarpments. Most of the acreage of these associations is used for dairy farming. Areas of steeper soils are generally wooded.

3. *Hilton-Appleton-Ontario association*

Deep, well drained to somewhat poorly drained, medium-textured soils formed in glacial till from sandstone and limestone

This association covers about 4 percent of the survey area, and is on an area of the uplands in the towns of Frankfort and Litchfield, south of the Mohawk River. The soils are nearly level to moderately steep.

Hilton soils make up about 35 percent of the association; Appleton soils, about 25 percent; Ontario soils, about 20 percent; and minor soils, about 20 percent. All the major soils are deep and medium textured and formed in similar deposits of firm, calcareous glacial till derived mainly from sandstone and limestone.

Hilton soils are moderately well drained and are gently sloping to moderately sloping. They are on landscapes where runoff is somewhat slow or where water accumulates.

Appleton soils are somewhat poorly drained and are nearly level and gently sloping. They are on landscapes where runoff is slow or on foot slopes below areas of Hilton and Ontario soils where runoff accumulates.

Ontario soils are well drained and gently sloping to moderately steep. They are on landscapes where water does not accumulate, usually at elevations higher than Hilton or Appleton soils.

Among the minor soils are Lyons, Lansing, Conesus, Honeoye, and Lima soils. The Lyons soils are wetter and occupy low areas and depressions. The Lansing and Conesus soils are more shaly and occupy the eastern part of the town of Frankfort. The Honeoye and Lima soils are higher in lime content and are in the town of Litchfield.

Most of the acreage of this association is in farms where slopes are more gentle and in pasture and forest where slopes are steeper. Drainage of wet areas is needed. Dairying is the principal type of farming in the area.

Wetness in places limits the building of houses with basements. The firm glacial till substratum limits the use of all the soils in this association for septic-tank filter fields. Most of the soils will support buildings, but onsite investigation is necessary before building.

Except for areas of wet soils, the major soils in this association are suited to most recreational uses. Excessive slope in some places limits them for a few uses.

4. Manheim-Conesus-Lansing association

Deep, somewhat poorly drained, medium-textured soils formed in glacial till from alkaline shale, and moderately well drained and well drained soils formed in till from shale, siltstone, and limestone

This is the second largest association in the survey area. It covers about 18.5 percent of the survey area and is on uplands both north and south of the Mohawk River. The soils are nearly level to steep.

Manheim soils make up about 25 percent of the association; Conesus soils, 16 percent; Lansing soils, about 15 percent; and minor soils, about 44 percent. The major soils are deep and medium textured and formed in firm, calcareous till.

Manheim soils are somewhat poorly drained and formed in till rich in dark-colored shale. They are nearly level and gently sloping and occupy areas where runoff is slow, or foot slopes below areas of Lansing and Conesus soils where water accumulates.

The Conesus soils formed in till derived mainly from shale, siltstone, and limestone. They are moderately well drained and gently sloping and occupy landscapes where runoff is somewhat slow or where water accumulates.

The Lansing soils formed in till derived mainly from shale, siltstone, and limestone. They are well drained and nearly level to steep and are in areas where runoff water does not accumulate. They are generally situated above Conesus and Manheim soils. Lansing soils are extremely stony in places.

Among the minor soils are Ilion, Mohawk, Manlius, Hornell, and Burdett soils. Ilion soils are wetter and are in the lowest spots and depressions. Mohawk soils are in areas where the glacial till contains a large amount of black shale. Manlius and Hornell soils are in areas of soils that are moderately deep to underlying acid gray shale. Burdett soils are in areas of soils that have moderately fine textured subsoils.

Most of the soils in this association are in farms or in forest. Areas where the soil is wet need to be drained. Dairying is the principal type of farming in the area.

Wetness in places imposes limitations for houses with basements and many other urban uses. The firm, slowly permeable substrata limit the use of these soils for septic-tank filter fields. Most of the soils will support buildings but onsite investigation is necessary before building. In places slope imposes some limitations for certain urban uses.

5. Appleton-Lansing-Conesus association

Deep, somewhat poorly drained to well-drained, medium-textured soils formed in glacial till from shale, siltstone, sandstone, and limestone

This association covers about 1 percent of the survey area and is on the uplands west of the village of Frankfort. The soils are nearly level to steep.

Appleton soils make up about 30 percent of the association; Lansing soils, about 20 percent; Conesus soils, 20 percent; and minor soils, 30 percent. The major soils are deep and medium textured, and formed in calcareous till derived mainly from shale, siltstone, sandstone, and limestone.

Appleton soils are somewhat poorly drained and are nearly level to gently sloping. They occupy areas where runoff is slow or foot-slope areas where runoff accumulates.

Conesus soils are moderately well drained and are gently sloping. They occupy areas where runoff is somewhat slow or where runoff water accumulates.

Lansing soils are well drained and are nearly level to steep. They are on areas where water does not accumulate and are generally situated above Conesus and Appleton soils.

Among the minor soils are Ontario, Hilton, Manheim, Lyons, and Ilion soils. Ontario, Hilton, and Manheim soils are well drained to somewhat poorly drained. Lyons and Ilion soils are wetter, and are in low spots and depressions.

Most of the soils in this association are in farms where slopes are more gentle and in pasture and forest where slopes are steeper. Areas where the soil is wet need drainage. Dairying is the principal type of farming in the area.

Excessive slope and wetness are the principal limitations for urban uses of the soils in this association. Wetness in places limits their use for houses with basements. The firm, slowly permeable substrata limit the use of nearly all of these soils for septic-tank filter fields. These soils will support most structures, but onsite investigation is necessary before building.

Excessive slope and wetness limit the use of the soils in this association for some recreational uses.

Deep to Shallow Soils Formed in Calcareous and Noncalcareous Glacial Till; on Uplands

These associations occupy glacially modified, bedrock-controlled till plains interspersed with deep, dissected till plains. The soils formed in deep to shallow glacial till that ranges from medium to fine in texture and is calcareous or noncalcareous. They are nearly level to very steep. Areas that have favorable slopes are used principally for dairy farming. Areas of steeper soils are mostly wooded or idle.

6. Honeoye-Wassaic-Farmington association

Deep to shallow, well-drained, medium-textured soils formed in glacial till from limestone and siltstone

This is the most extensive association in the survey area. It covers about 25 percent of the survey area and is on uplands south of the Mohawk River. The soils are nearly level to steep. They occupy glacially modified, bedrock-controlled till plains that are intermingled with deep, dissected till plains.

Honeoye soils make up about 33 percent of the association; Wassaic soils, about 13 percent; Farmington soils, about 10 percent; and minor soils, about 44 percent. All the major soils are medium in texture and formed in glacial till derived mainly from limestone and siltstone.

Honeoye soils are deep, well drained, and gently sloping to steep. They occupy dissected till plains and side slopes of drumloidal landforms. In some areas the soils are very stony.

Wassaic soils are moderately deep and nearly level to moderately steep. Limestone bedrock is at a depth of 20 to 40 inches. The soils occupy glacially modified, bedrock-controlled till plains.

Farmington soils are shallow, well drained, and nearly level to steep. They are closely associated with Wassaic soils on glacially modified, bedrock-controlled till plains. Limestone bedrock is ordinarily at a depth of 10 to 20 inches but there are some areas where the soil is very shallow and extensive areas of bedrock are exposed.

Among the minor soils are Lima and Appleton soils, Carlisle soils, and Palms muck. Lima and Appleton soils are in areas where slope is nearly level and on foot slopes below Honeoye and Lyons soils. Carlisle soils and Palms muck are in depressions and level areas.

The deep, well-drained Honeoye soils in this association are some of the best in the county for farming. The moderately deep Wassaic soils, on the other hand, are slightly limited for farming because of droughtiness during dry periods, and the shallow Farmington soils are quite droughty and difficult to till because of rock outcrops and the shallow depth to bedrock. Dairying is the principal type of farming in the area.

The firm substratum in the Honeoye soils and the limestone bedrock substratum in the Wassaic and Farmington soils limit their use for septic-tank filter fields. The major soils in this association will support most structures, but onsite investigation is necessary before building. The limestone bedrock underlying the Wassaic and Farmington soils and the excessive slope in a few areas limit them for some urban uses. These soils are a possible source of limestone bedrock for crushing.

Excessive slope and depth to bedrock limit the use of the major soils in this association for recreation. The moderately deep and shallow soils are adapted to recreational areas that do not require excessive movement of soil material or reshaping of the landscape.

7. *Mohawk-Manheim association*

Deep, well-drained to somewhat poorly drained, medium-textured soils formed in glacial till from alkaline shale

This association covers about 8 percent of the survey area and is on uplands north of the Mohawk River, between the village of Herkimer and the city of Little Falls. The soils are nearly level to moderately steep. They occupy ridgetops, side slopes, and breaks along entrenched drainageways.

Mohawk soils make up about 35 percent of this association; Manheim soils, about 20 percent; and minor soils, about 45 percent. The major soils are medium in texture and formed in calcareous glacial till rich in dark-colored alkaline shale.

The Mohawk soils are well drained to moderately well drained. Dark-colored shale bedrock is at a depth of 40 to 60 inches in most areas. The soils are gently sloping to moderately steep and are on dissected till plains.

Manheim soils are similar to Mohawk but deeper and somewhat poorly drained. They are nearly level to moderately sloping and commonly occupy slopes below areas of Mohawk soils, from which they receive runoff. They are also on flat ridgetops and in depressions where runoff is slow.

Among the minor soils are Ilion, Palatine, Lansing, and Conesus soils. Ilion soils are in low spots and depressions, and Palatine soils are in areas where the soil is moderately deep to shale bedrock. In places Lansing and Conesus soils contain less dark shale than the major soils and some minor soils in this association.

Most of the soils that have more gentle slopes are in farms. Areas where the soils have steeper slopes are in pasture and forest. Wet spots need to be drained. In areas where these soils are at elevations of about 1,500 feet, the short growing season limits the crop varieties that can be successfully grown. Dairying is the principal type of farming in the area.

The soils in this association have limitations for septic-tank filter fields. Seasonal wetness over much of the area imposes limitations for houses with basements. Excessive slope in places and the shale bedrock substratum impose limitations for certain other urban uses. These soils generally will support most structures, but onsite investigation is necessary before building.

Wetness is the principal limitation on recreational uses of the soils of this association. Steep slopes in a few areas impose limitations for other recreational uses.

8. *Lansing-Hornell-Manlius association*

Deep, well-drained, medium-textured soils formed in glacial till from shale, siltstone, and limestone, and moderately deep, somewhat poorly drained to excessively drained, medium-textured soils formed in till from acid shale

This association covers approximately 7 percent of the survey area and is on upland areas in the southern part of the county. The soils are nearly level to steep. They occupy glacially modified, bedrock-controlled till plains intermingled with deep, dissected till plains.

Lansing soils make up about 26 percent of the association; Hornell soils, about 21 percent; Manlius soils, about 13 percent; and minor soils, about 40 percent.

The Lansing soils are deep, well drained, medium in texture, and moderately sloping to steep. They formed in calcareous glacial till derived mainly from shale, siltstone, and limestone. They occupy dissected till plains.

The Hornell soils are somewhat poorly drained to moderately well drained and are nearly level to moderately sloping. They have medium-textured surface layers and moderately fine and fine textured subsoils. They are moderately deep over acid shale bedrock and formed in till or partially in residuum derived mainly from acid shales. They occupy glacially modified, bedrock-controlled till landscapes where runoff is slow or somewhat slow and foot-slope areas where water accumulates.

Manlius soils are well drained to excessively drained, and gently sloping to moderately steep. They are medium textured throughout. The subsoil has a high content of shale fragments. These soils are moderately deep over acid shale bedrock. They formed in till or partially in residuum derived mainly from acid shales. They generally occupy glacially modified, bedrock-controlled till landscapes where runoff is rapid and water does not accumulate.

Among the minor soils are Conesus, Manheim, Ilion, and Allis soils. The Conesus, Manheim, and Ilion soils are deep and are in lower, more poorly drained positions than the Lansing soils. The Allis soils formed in moderately deep till over acid shale bedrock. They occupy wet low spots and depressions.

The gently sloping areas in this association are mostly in farms or idle. Areas of steeper slopes are wooded or in pasture. The soils in this association require a high degree of management. This includes draining wet areas and applying lime and fertilizer where needed. Some of the less productive soils formed in till over shale bedrock. These soils are no longer used for farming. Dairying is the principal type of farming in the area.

Excessive slope, limited depth to bedrock, and wetness are the principal limitations for urban uses of the soils in this association. Wetness and moderate depth to bedrock impose limitations, in places, for houses with basements. Nearly all the soils have limitations for septic-tank filter fields. Most of these soils will support most structures, but onsite investigation is necessary before building.

Excessive slope in places, depth to bedrock, and wetness limit the use of the soils in this association for recreation. For the most part, these soils are adapted to recreational uses that do not require excessive soil movement or reshaping of the landscape.

9. *Mohawk-Manlius-Hornell association*

Deep, well drained and moderately well drained, medium-textured soils that formed in glacial till from alkaline shale and moderately deep, excessively drained to somewhat poorly drained, medium-textured soils formed in till from acid shale

This association (fig. 2) covers approximately 3 percent of the survey area and is on uplands south of the city of Little Falls. The soils are nearly level to moderately steep. They are on ridgetops and along deeply dissected drainageways on glacially modified, bedrock-controlled till plains.

Mohawk soils make up about 30 percent of the association; Manlius soils, about 13 percent; Hornell soils, about 13 percent; and minor soils, about 44 percent.

Mohawk soils are well drained and moderately well drained, medium in texture, and gently sloping to moderately steep. They formed in calcareous till rich in dark-colored alkaline shale. Dark-colored shale bedrock is at a depth of 40 to 60 inches over most of the area. The soils occupy landscapes where little or no water accumulates.

The Manlius soils are well drained to excessively drained and medium textured throughout. They are moderately deep over acid shale bedrock and formed in till or partially in residuum from these acid shales. The subsoil has a high content of shale fragments. These soils are gently sloping to moderately steep and mainly occupy landscapes where runoff is rapid and water does not accumulate.

Hornell soils are somewhat poorly drained or moderately well drained and are nearly level to moderately sloping. They have a medium-textured surface layer and a moderately fine textured to fine textured subsoil. They are moderately deep over acid shale bedrock and formed in till or partially in residuum from these acid shales. The soils occupy landscapes where runoff is slow or somewhat slow and where water accumulates.

Among the minor soils are Manheim, Ilion, and Allis soils. Manheim and Ilion soils are wetter and are on foot slopes, low areas, and depressions below areas of Mohawk soils. Allis soils are on flat areas or in low spots and depressions below areas of Manlius and Hornell soils.

Most of the more gently sloping soils in this association are in farms. Steeper areas are wooded or in pasture. The soils in this association, for the most part, require a high degree of management. Particular attention to control of erosion and to drainage is needed. The moderately deep soils tend to be droughty during dry periods. Dairying is the principal type of farming in the area.

Excessive slope, wetness, and depth to bedrock impose limitations for urban uses of these soils in places. In places wetness and moderate depth to bedrock impose limitations for houses with basements. Nearly all of the soils have limitations for septic-tank filter fields. The soils will support most buildings, but onsite investigation is necessary before building.

In many places these soils are adapted to recreational uses that do not require excessive soil movement or reshaping of the landscape.

10. *Rough broken land-Shaly rock land association*

Deep to very shallow, steep and very steep land

This association covers about 4 percent of the survey area. It occurs along breaks where streams have deeply dissected the uplands.

Rough broken land makes up about 62 percent of this association; Shaly rock land, very steep, about 24 percent; and minor land types and soils, about 14 percent. Rough broken land is very steep, deep, glacial till material. Shaly rock land, very steep, is steep and very steep, shallow to deep till material underlain by gray, black, red, and green shale bedrock. Among the minor land types and soils are Sandstone rock land, outcrops of granite, and steep Honeoye and Lansing soils.

The soils in this association are too steep to farm. They provide poor pasture in a few areas.

This association is severely limited for urban uses because of its steep and very steep slopes. Shaly rock land, very steep, is a source of shale material in places. Sandstone rock land is a source of sandstone bedrock in places.

These soils have limited suitability for recreational use and wildlife habitat.

Deep Soils Formed in Calcareous Glacial Till and in Glaciolacustrine Sediment Over Loamy Glacial Till or Outwash; on Upland-Lake Plain Fringe Areas

These associations occupy fringe areas of dissected glacial till plains and lake plains, mostly adjacent to the

***Figure 2.*—Landscape in the Mohawk-Manlius-Hornell association. Mohawk soils occupy the cultivated areas in the center of the picture, and Manlius soils the steeper, wooded area in the background.**

major valleys. The soils formed in deep glacial till rich in dark-colored shale and in lacustrine silt and clay deposits that are generally 40 to 60 inches deep over loamy till or outwash. Dairy farming is the principal use of the soils of these associations.

11. Hudson-Rhinebeck association

Deep, moderately well drained to somewhat poorly drained, medium-textured soils formed in lacustrine sediment over loamy glacial till or outwash

This association covers about 0.5 percent of the survey area and is in a small valley that extends from the city of Little Falls to Kast Bridge. The soils are nearly level to moderately steep. They occupy lake plains.

Hudson soils make up about 40 percent of the association; Rhinebeck soils, about 30 percent; and minor soils, about 30 percent. The major soils have a medium-textured surface layer and a fine textured and moderately fine textured subsoil. The major soils formed in lacustrine silt and clay that is 40 to 60 inches thick over loamy till or outwash.

Hudson soils are moderately well drained and gently sloping to moderately steep. They are in areas where runoff is somewhat slow or where some water accumulates.

Rhinebeck soils are similar to Hudson soils, but are nearly level and gently sloping. They are in areas where runoff is slow, or are on foot slopes below areas of Hudson soils where water accumulates.

Among the minor soils are Ilion, Herkimer, Teel, and Wayland soils. The Ilion soils are in low spots and depressions and the Herkimer soils are on gravelly alluvial fans. The Teel and Wayland soils are on flood plains along streams.

Most of the better drained soils are in farms. Drainage on the more gentle slopes and erosion on the steeper slopes are particularly important when farming these soils. Dairying is the principal type of farming in the area.

Wetness and a lack of strength are the principal limitations of the soils in this association when they are used for urban purposes. Onsite investigation is necessary before building.

Excessive wetness is the principal limitation for recreational uses of the soils in this association.

12. Mohawk-Manheim-Rhinebeck association

Deep, well-drained to somewhat poorly drained, medium-textured soils formed in glacial till from alkaline shale, and somewhat poorly drained, medium-textured soils formed in lacustrine sediment over loamy glacial till or outwash

This association covers about 5 percent of the survey area and is on upland landscapes of intermediate elevation where lake plain sediment overlaps dissected till plain areas in an erratic pattern. The soils are nearly level to moderately steep.

525-444—75——2

Mohawk soils make up approximately 25 percent of the association; Manheim soils, about 25 percent; Rhinebeck soils, 20 percent; and minor soils, about 30 percent.

Mohawk soils are well drained to moderately well drained and gently sloping to moderately steep. They are medium in texture. Dark-colored shale bedrock is at a depth of 40 to 60 inches over most areas of these soils. These soils occupy dissected till plains.

The similar but deeper, somewhat poorly drained Manheim soils are nearly level to moderately sloping. They commonly occupy foot slopes below areas of Mohawk soils, from which they receive runoff. They are also on flat ridgetops and in depressions where runoff is slow.

Rhinebeck soils are somewhat poorly drained and nearly level to gently sloping. They formed in lacustrine silt and clay 40 to 60 inches thick, mainly over loamy till. These soils have a medium-textured surface layer and a fine textured to moderately fine textured subsoil. They are on fringe areas where lake plains overlap dissected upland till landscapes.

Among the minor soils are Ilion, Hudson, Hartland, and Agawam soils. Ilion soils are wetter and are associated with Mohawk and Manheim soils in low areas and depressions. Hudson soils are in higher, better drained positions above areas of Rhinebeck soils. Hartland and Agawam soils formed in areas dominated by medium-textured lacustrine sediment.

Most of the better drained soils are in farms. Drainage in areas where slopes are more gentle and control of erosion where the slopes are steeper are particularly important when farming these soils. Dairying is the principal type of farming in the area.

Wetness and lack of strength are the principal limitations of the dominant lacustrine soils in this association for urban uses. The Mohawk soils have a shale substratum that imposes limitations on some urban uses such as septic-tank filter fields and houses with basements. The wetness of Manheim soils imposes limitations for urban uses. Onsite investigation is necessary before building.

Wetness is the principal limitation for recreational uses of the soils in this soil association. Excessive slope in a few places limits these soils for some recreational uses.

Deep Soils Formed in Recent Alluvium; on Flood Plains

This association occupies flood plains along the Mohawk River and West Canada Creek. The soils formed in deep deposits of recent alluvium and are subject to flooding. Dairying is the principal type of farming.

13. Alluvial land-Hamlin-Teel association

Deep, excessively drained to very poorly drained soils of variable texture that formed in recent alluvium

This is the only association on flood plains. It covers about 4 percent of the survey area and is along the Mohawk River and West Canada Creek (fig. 3). The soils formed in recent alluvium that ranges from gravelly material to silt loam in texture. They are level or nearly level and are subject to flooding.

Hamlin soils make up about 18 percent of the association; Teel soils, about 18 percent; Alluvial land, about 30 percent; and minor soils, about 34 percent.

Alluvial land consists of nearly level areas of unconsolidated alluvium that varies widely in texture and drainage over short distances. This land type is in long narrow areas that are frequently flooded.

Hamlin soils are deep, well drained, and medium and moderately coarse in texture. They occupy the higher, better drained positions on flood plains.

Teel soils are deep and moderately well drained to somewhat poorly drained. They are medium textured or moderately coarse textured. Teel soils occupy positions below areas of Hamlin soils on flood plains or areas where the water table is within 1 to 2 feet of the surface for long periods.

Among the minor soils are Wayland, Cohoctah, and Herkimer soils. Wayland and Cohoctah soils are wetter and are in low spots and old stream channels. Herkimer soils are on old alluvial fans.

This association includes some of the best soils for farming in the county. They respond well to good management. Wet areas need to be drained. Dairying is the principal type of farming, but garden crops are also important. Flooding reduces crop yields occasionally.

The soils in this association are limited for urban uses by the hazard of flooding. They commonly lack supporting strength for structures when wet. These soils are a good source of topsoil.

The hazard of flooding also limits these soils for recreational uses. The soils in this association not adversely affected by flooding during the season of use are suited to recreational activities.

Soils Formed in Deep Deposits; on Glacial Outwash Terraces, Kames, Deltas, and Old Alluvial Fans

These associations occupy intermediate elevations between flood plains and uplands along the major drainage systems. The soils formed in water-sorted gravelly and shaly and sandy glacial outwash. They are nearly level to gently sloping on deltas and old alluvial fans and portions of outwash terraces. They are moderately sloping to very steep on kames and terrace escarpments. Many of the urban areas in the county are in these associations. Other areas are used principally for dairy farming and growing truck crops.

14. Herkimer association

Deep, well drained and moderately well drained, medium-textured soils formed in water-sorted deposits rich in dark, alkaline shale

This association covers about 2 percent of the survey area, and is on gravelly and shaly, glacial alluvial fans. The soils are nearly level to gently sloping. They formed in valleys filled with glacial stream sediment.

Herkimer soils make up about 75 percent of this association, and minor soils make up about 25 percent.

The Herkimer soils are gravelly and have a high content of calcareous, dark-colored shale chips. They are well drained and moderately well drained and are on

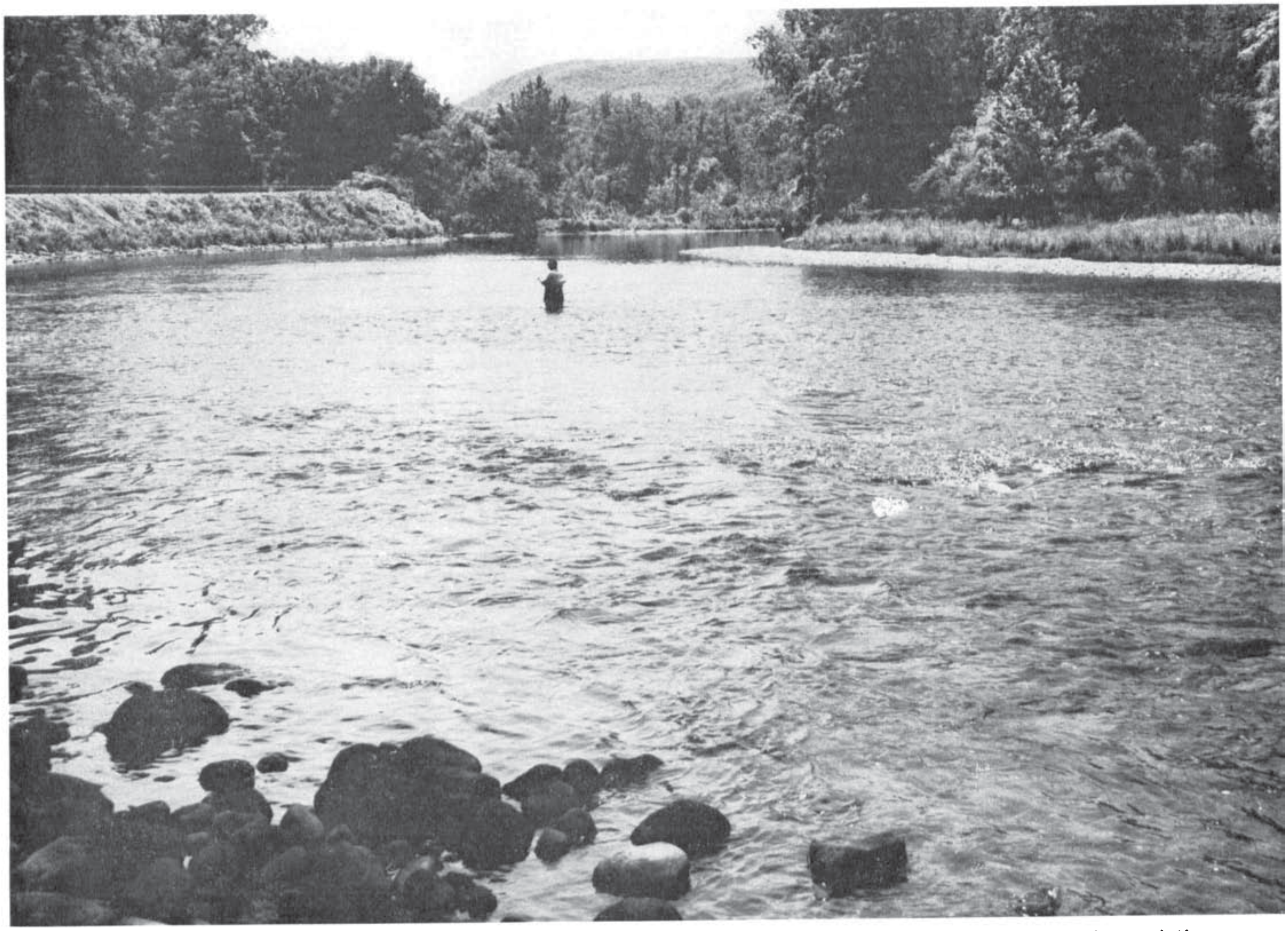


Figure 3.—**View along West Canada Creek, a good trout-fishing stream in the Alluvial land-Hamlin-Teel association.**

glacial alluvial fans where side streams from regions of dark-colored calcareous shale enter major valleys.

Among the minor soils are Fredon, Halsey, Howard, and Phelps soils. The Fredon and Halsey soils are wetter and are in the lower positions. Howard and Phelps soils have a lower percentage of dark-colored shale fragments in the soil profile and a clay accumulation in the subsoil.

The soils in this association are well suited to farming. They have favorable relief, and they respond to good management. Dairying is the principal type of farming, but market crops are also important.

Moderately well drained soils in this association are limited for septic-tank filter fields and houses with basements. Extensive areas of the principal soils in this association are occupied by villages. Although these soils formed in water-deposited material, they generally will support most structures. Onsite investigation is necessary before building.

The major soils are well suited to many recreational uses, but the gravelly surface texture limits their use for athletic fields.

15. *Howard-Phelps association*

Deep, somewhat excessively drained to moderately well drained, medium-textured and moderately coarse textured soils formed in water-sorted deposits from siltstone, sandstone, limestone, and some granite

This association covers about 7 percent of the survey area and is on glacial stream channels that have been filled with outwash sediment. The soils are nearly level on terrace benches to steep and very steep on terrace escarpments and kames.

Howard soils make up about 40 percent of this association; Phelps soils, about 10 percent; and minor soils, about 50 percent.

Howard soils are deep, well-drained to somewhat excessively drained, and nearly level to very steep. They are medium and moderately coarse in texture. They occupy gravelly outwash terraces, deltas, and kames.

Phelps soils are similar to Howard and are moderately well drained and nearly level to very gently sloping. They are moderately coarse textured. They occupy low areas of terrace landscapes where the water table is seasonally within 18 to 24 inches of the surface.

Among the minor soils are Fredon, Halsey, and Palmyra soils. Also included is the miscellaneous land type, Alluvial land. Fredon and Halsey soils are wetter and are in wet spots and depressions. Palmyra soils are in most of the well-drained areas of this association in the town of Winfield. Alluvial land is on frequently flooded flood plains.

The major soils in this association are well suited to farming. Where they have favorable relief, they respond to good management. Dairying is the principal type of farming, but market garden crops are also important.

Extensive areas of this association are occupied by cities and villages. Moderately well drained areas are limited for septic-tank filter fields and houses with basements. Although the major soils formed in water-deposited material, they generally will support light structures. Onsite investigation is necessary before building. Steep slopes limit some areas for urban uses. The outwash soils in this association are generally a good source of sand and gravel.

16. Howard-Fredon association

Deep, somewhat excessively drained to poorly drained, medium-textured and moderately coarse textured soils formed in water-sorted deposits from siltstone, sandstone, limestone, and some granite

This association covers about 1 percent of the survey area and is on a gravelly outwash terrace area south of the Mohawk River along the Herkimer-Oneida County line. The soils are nearly level on terrace benches to very steep on terrace escarpments.

Howard soils make up about 30 percent of the association; Fredon soils, about 30 percent; and minor soils, about 40 percent.

Howard soils are deep, well-drained to somewhat excessively drained, and nearly level to very steep. They are medium and moderately coarse in texture. They occupy gravelly outwash terraces, deltas, and kames.

Fredon soils are deep, somewhat poorly drained to poorly drained, and nearly level. They formed in similar materials to Howard. They occupy depressional areas of terrace landscapes where the water table is seasonally within 6 to 18 inches of the surface.

Among the minor soils are Phelps and Halsey soils. Also included are the miscellaneous land types Alluvial land and Cut and fill land. Phelps soils are in wetter positions than the Howard soils and in better drained areas than the Fredon soils. Halsey soils are on the lowest, wettest positions along streams and in depressions. Alluvial land is in frequently flooded areas along streams. Cut and fill land is along the old Erie Canal and railroad right-of-way next to the city of Utica.

In areas where slope is favorable, the well-drained soils in this association are well suited to farming. With adequate drainage, the wet soil areas are also well suited to farming and respond well to good management. Dairying is the principal type of farming.

The seasonal high water table over a fairly high percentage of the area of this association imposes a limitation for homesite location and septic-tank filter fields. Although these soils formed in water-deposited material, they generally will support light structures. Onsite investigation is necessary before building.

Suitability of the major soils for recreational uses is variable from place to place because of extremes of wetness and dryness and also because of gravel in the surface layer of the better drained Howard soils.

17. Hinckley-Windsor association

Deep, excessively drained, coarse-textured soils formed in water-sorted deposits of sand, or gravel and sand, that are rich in granite and gneiss

This association covers about 5 percent of the survey area and is on sand and gravel terraces and deltas along the northern fringe of the area. The soils are nearly level on terrace benches to very steep on terrace escarpments.

Hinckley soils make up about 50 percent of the association; Windsor soils, about 30 percent; and minor soils, about 20 percent. The major soils are excessively drained. coarse in texture, and nearly level to very steep.

The Hinckley soils formed in stratified gravelly and sandy outwash and contain numerous gravelly and cobbly fragments throughout the profiles.

Windsor soils formed mainly in sand but they contain some gravel and cobblestones in places. Some areas have formed dunes as a result of soil blowing.

Among the minor soils are Fredon, Halsey, Hartland, and Agawam soils. Fredon and Halsey soils are in wet spots and low areas near streams. Hartland and Agawam soils are in areas mantled by medium-textured and moderately coarse textured sediment.

The major soils in this association are droughty and low in natural fertility.

In areas where slope is favorable, the light texture and the hazard of soil blowing on the sandier soils impose limitations for some urban uses. The soils generally will support light structures, but onsite investigation is necessary before building. Hinckley soils are an excellent source of sand and gravel (fig. 4). Windsor soils are an excellent source of sand.

Adverse texture, droughtiness, and in places excessive slope impose limitations on the use of the soils in this association for recreation.

Use and Management of the Soils

In the first part of this section, the general practices applicable to the soils of the survey area are discussed. In the second part, the soils are grouped in capability classes to show their relative suitability for farming, and suggestions for the use and management of the soils in each capability unit are given. Included in this section is a table showing estimated average yields per acre for each of the soils at different levels of management. In addition, soils are grouped according to their suitability for use as woodland, and interpretations for wildlife habitat are given for each soil. The last parts of this section present information about soil properties that are important to engineers and builders, and also rate the soils for town and country planning.

Figure 4.—**An area of a Hinckley soil that is being mined for sand and gravel.**

General Management for Farming [2]

In this section, general principles of soil management are discussed, the system of capability classification used by the Soil Conservation Service is described, and suggested management practices for each capability unit are given.

Most of the crops commonly grown in Herkimer County are for the support of dairying. They consist mainly of alfalfa, birdsfoot trefoil, clover, timothy, bromegrass, and orchardgrass for hay and pasture; corn for silage or grain; and oats.

Although the soils in southern Herkimer County vary in their suitability for specific crops and require widely varying management practices, some basic or general principles of management apply to all the soils suitable for farm crops and pasture throughout the county. These are discussed in the following paragraphs.

The soils in the county vary in their need for lime and fertilizer. The amounts needed are best determined by the results of soil tests, the needs of the particular crop, and the expected level of yield. For assistance in getting the tests made and in interpreting them, farmers and others should consult their cooperative extension agent. Only the general or usual lime and nutrient level of each soil is given in this publication. Also, new research findings are presented in annually revised editions of "Cornell Recommends for Field Crops" and "Vegetable Production Recommendations," both prepared by the staff of the New York State College of Agriculture at Cornell University. In the absence of soil tests, these references, in conjunction with this publication, can be used as a guide in determining lime and fertilzer needs.

Most of the soils of Herkimer County are fairly high in content of organic matter. It is important, however, to maintain it at a high level by using farm manure and working crop residues into the soil. If crops that produce little residue are grown, the cropping system should provide cover crops and sod crops.

In Herkimer County, wetness is a limitation on about 23 percent of the acreage of soils suitable for cropping, such as the somewhat poorly drained Manheim soils and the poorly drained Ilion soils. Few or no special practices are needed for improving drainage on moderately well drained soils, such as the Hilton and Lima soils. Crops grow well on most of the somewhat poorly drained, poorly drained, and very poorly drained soils if excess water has been removed by tile or surface drainage, or both (fig. 5). Land smoothing is also beneficial in places.

Erosion on farms is a principal source of sediment and ranks above domestic sewage and industrial wastes and chemicals as a major cause of water pollution. In southern Herkimer County, all of the gently sloping and steeper soils are subject to erosion if cultivated. On erodible soils such as Honeoye silt loam, 3 to 8 percent slopes, or Lansing silt loam, 8 to 15 percent slopes, a cropping system that controls runoff and erosion is needed, in combination with other erosion-control practices. As used here, the term "cropping system" refers to the sequence of crops grown, as well as management that includes minimum tillage, no-plow planting, use of crop residue, growing of cover crops, and use of lime and fertilizer. Other erosion-control practices are cross slope tillage, contour cultivation, stripcropping, terracing, and the use of diversion terraces and grassed waterways. The effectiveness of a particular combination of these measures differs from one soil to another but different combinations can be equally effective on the same soil. The local representative of the Soil Conservation Service can assist in planning an effective cropping system.

Pasture is effective in controlling erosion on all but a few of the soils that are subject to erosion. A high level of pasture management is needed on some soils to provide enough ground cover to keep the soil from eroding. A high level of pasture management provides for fertilization, control of grazing, selection of pasture mixtures, and other practices that help maintain good ground cover and forage for grazing.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of soils for range, for forest trees, or for engineering.

[2] This section was prepared by E. L. McPHERRON, agronomist, Soil Conservation Service.

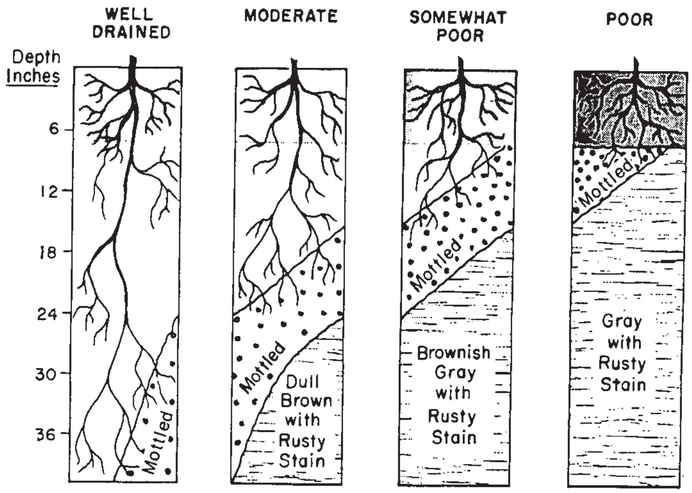


Figure 5.—**Effect of soil drainage on root development.**

In the capability system, all kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed 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, 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, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, 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 largely to pasture, range, woodland, or wildlife. (None in this survey area.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Herkimer County, Southern Part, are described and suggestions for the use and management of the soils are given.

Management by capability units

In the following pages each of the capability units in the survey area is described. The names of soil series represented are mentioned in the description of each unit, but this does not mean that all the soils of a given series are in the unit. The "Guide to Mapping Units" shows the unit for each individual soil. Some of the mapping units that are extremely variable or are not commonly cropped have not been assigned to capability groups. These are Alluvial land; Cut and fill land; Rough broken land; Sandstone rock land; Shaly rock land, very steep; Carlisle muck; and Palms muck.

CAPABILITY UNIT I-1

This unit consists of deep, medium-textured, level and nearly level, gravelly soils of the Herkimer and Palmyra series. These soils formed in glacial outwash material on terraces and fans. They are generally well drained, but in places the Palmyra soils are excessively drained.

Soils of this unit are medium to high in content of lime and moderate to low in natural fertility. Available water capacity is moderate.

Soils of this unit are well suited to all crops commonly grown in the county and are especially well adapted to deep-rooted crops. Cultivated row crops in rotation are generally more desirable on these soils than permanent pasture or woodland. These soils respond well to good management.

Surface stones in places interfere with machinery used to cultivate and harvest vegetable crops. Row crops can be grown repeatedly if the content of organic matter is maintained and soil structure is preserved. Organic matter can be replenished annually by returning crop residue to the soil and growing cover crops, or by including in the rotation an occasional sod crop. Keeping tillage to a minimum helps preserve soil structure.

Irrigation is needed in some years, especially on the Palmyra soils. Water can be applied rapidly and in large quantities, and there is little or no danger of crusting and sealing. These soils can be cultivated safely soon after irrigation because there is little or no danger of compaction.

CAPABILITY UNIT I-2

This unit consists of deep, level and nearly level, well-drained, medium-textured and moderately coarse textured soils of the Hamlin series. These soils formed in alluvium on flood plains and are subject to occasional overflow.

Soils of this unit are medium in content of lime and moderate to high in natural fertility. Available water capacity is high.

The soils of this unit are well suited to all crops commonly grown in the county, including deep-rooted types. Occasional flooding is a limiting factor, but these soils rarely flood during the growing season. If well managed, these soils can be used continuously for row crops. Lime and fertilizer applications give excellent response. Maintaining tilth and organic-matter content, and controlling erosion, are seldom difficult.

These soils are easy to work. In some places land shaping is needed for surface drainage. Winter cover is desirable on these soils. The improvement and maintenance of existing stream channels and the construction of levees help control flooding in places.

These soils are well adapted to irrigation because of their location close to water sources and their depth and permeability.

CAPABILITY UNIT IIe-1

This unit consists of medium-textured, gently sloping soils of the Canton, Honeoye, Mohawk, Palatine, and Wassaic series. These soils are on uplands. The Canton, Honoeye, Mowhawk, and Ontario soils are deep, and the Palatine and Wassaic soils extend to a depth of 20 to 40 inches. The Palatine soils are underlain by dark calcareous shale, and the Wassaic soils by jointed limestone bedrock. Soils of this unit are generally well drained, but in places Mohawk soils are moderately well drained and Palatine soils are somewhat excessively drained.

All of the soils in this unit except Canton are high or medium in content of lime and moderate to high in natural fertility. Canton soils are low in content of lime and low to moderate in natural fertility. Available water capacity is moderate to high in the soils in this unit. Runoff is medium and the hazard of erosion is slight to moderate if these soils are left unprotected.

The soils of this unit are suited to all the crops commonly grown in the county. Rotations that include occasional sod crops are needed to maintain soil structure. Several consecutive years of row crops can be grown on the shorter and more level slopes, however, if tillage is kept to a minimum and crop residue is returned to the soil. A few large stones on the surface of Canton soils interfere slightly with tillage.

Response to applications of lime and fertilizer is generally very good. Soil and water losses on the soils in this unit that have long slopes can be reduced by contour stripcropping, grassed waterways, and other erosion-control measures that slow water runoff. A cropping system that keeps tillage to a minimum and maintains crop residue on the soil surface permits larger fields to be safely planted to row crops.

Tile drainage of wet spots is desirable but it is restricted in places by the moderate depth to bedrock of the Palatine and Wassaic soils.

CAPABILITY UNIT IIe-2

Manlius shaly silt loam, 3 to 8 percent slopes, is the only soil in this unit. It is medium textured, well drained to excessively drained, and gently sloping. This soil formed in thin upland till derived mainly from the underlying shale bedrock, which is at a depth of 20 to 40 inches.

This soil is very low in content of lime and low to moderate in natural fertility. Available water capacity is low to moderate. Runoff is medium and the hazard of erosion is slight to moderate if this soil is cultivated and left unprotected.

The soil in this unit is suited to all crops commonly grown in the county. Large amounts of lime are needed before legumes can be successfully grown, and fertilizer is needed for all crops. Shale fragments on the surface influence the selection of some crops in some places.

This soil needs careful management and protection from loss of water and soil. Contouring, contour stripcropping, and the use of crop residue and winter cover crops are measures that protect the soil surface and conserve rainfall.

A cropping system that incorporates the principle of no-plow minimum tillage can be used on this soil to control erosion and conserve water. Although this soil may need supplemental water, the feasibility of irrigation is questionable because of moderate soil depth to bedrock.

CAPABILITY UNIT IIe-3

The Hartland-Agawam complex, 3 to 8 percent slopes, provides the only soils in this unit. These soils are deep, medium textured, gently sloping, and well drained. They are on smoothly sloping to undulating stream terrace and lake plain landscapes.

The soils in this unit are low to medium in content of lime and low to moderate in natural fertility. Available water capacity is high. These soils are subject to soil blowing. The hazard of water erosion is moderate to severe if the soils are left unprotected. Complex slopes are common, so contour measures to control runoff and erosion are not always feasible.

The soils of this unit are well suited to all crops grown in the county, including vegetables. Erosion-control measures are needed if frequent row crops are planned. Although content of lime increases with depth, surface soils need additional lime for most crops. Fertilizer is needed for all crops.

Erosion is the only hazard to continuous cropping. Where possible, contouring, contour stripcropping, and returning crop residue to the soil permit more intensive use. An occasional sod crop included in the rotation also is helpful in maintaining soil tilth.

Irrigation water should be applied at a moderate rate. Deep-rooted crops do well without irrigation.

CAPABILITY UNIT IIe-4

This unit consists of deep, medium-textured, gently sloping, moderately well drained soils of the Bombay, Conesus, Hilton, and Lima series. These soils formed in glacial till on uplands.

The soils of this unit are medium to high in content of lime. All of these soils except Bombay are moderate to high in natural fertility. The Bombay soils, in places, are low in natural fertility. Available water capacity ranges from moderate to high in these soils. Runoff is medium and the hazard of erosion is slight to moderate if these soils are cultivated and left unprotected.

If properly managed, these soils are well suited to all crops grown in the county. Wetness early in spring delays planting briefly in places. Wetter areas require tile drainage to make fields more uniform. Lime needs vary, but some lime is needed for most crops. Fertilizers also are needed, but the ability of these soils to hold and supply nutrients is very good.

The soils of this group often have long slopes, and they erode in places where water concentrates. The maximum intensity of rotation should not exceed two years of row crops preceding a sod crop, if erosion-control practices are not applied. Contour stripcropping and grassed waterways generally control erosion and, if these measures are combined with diversions or terraces, the soils can be used more intensively. Tilth management, including keeping tillage to a minimum, not plowing when wet, and returning crop residue to the soil, is essential on all soils when a rotation with more than two consecutive years of row crops is used.

These soils are easily eroded if irrigation water is applied too rapidly. They should be cultivated before irrigation, in order to break up any crust that has formed. Maintaining large amounts of crop residue on the soil surface reduces crusting.

CAPABILITY UNIT IIe-5

This unit consists of medium-textured, gently sloping soils of the Hudson and Lairdsville series. These soils are generally moderately well drained, but the Lairdsville soils are well drained in places. The Hudson soils are deep. They formed in clayey lacustrine sediment over till or outwash. The Lairdsville soils formed in thin till derived mainly from underlying silty red shale at a depth of 20 to 40 inches.

The soils of this unit are high or medium in content of lime and moderate to high in natural fertility. Available water capacity is moderate to high. Runoff is medium and the hazard of erosion is slight to moderate if these soils are cultivated and left unprotected.

Soils of this unit are suited to most crops commonly grown in the county. The slowly permeable or moderately slowly permeable subsoil restricts water movement and causes slight wetness, which delays planting or grazing briefly in places in spring. Severe tilth management problems limit the use of these soils for intertilled crops in places. These soils are well suited to alfalfa when properly fertilized and harvested. Lime is generally needed to maintain the desired reaction in the surface soil, and fertilizer is needed for good response.

Working the land when the plow layer is too wet can lead to puddling and crusting, and requires a grass and legume sod to correct. It also compacts the upper part of the subsoil. Growing deep-rooted crops helps correct this problem. Random tile drainage systems or grassed waterways are often needed in areas of wet soils in depressions.

For erosion control, intensity of crop rotation should not exceed a year of corn, a year of grain, and two years of sod unless a safe water-disposal system is established. Where erosion-control measures are established, these soils should not be cultivated for many successive years without the occasional use of close-growing crops or crops high in residue and year-round cover, or both. Irrigation is complicated by crusting, puddling, and increased runoff and erosion.

CAPABILITY UNIT IIe-6

This unit consists of deep, medium-textured, gently sloping soils of the Broadalbin and Williamson series. The soils of both series have a slowly permeable fragipan that restricts water movement and root growth. The Broadalbin soils are well drained to moderately well drained. They formed in sorted silty or loamy deposits over till on uplands. The Williamson soils are moderately well drained. They formed in thick deposits of water- or wind-sorted silt and very fine sand on lake plains and uplands.

The soils of this unit are very low to medium in content of lime and low to moderate in natural fertility. Available water capacity is moderate to high. The hazard of erosion is moderate to severe even on these gentle slopes if the soils are cultivated and left unprotected.

If properly managed, the soils of this unit are well suited to all crops grown in the county. In some places, stones interfere with the operation of precision machinery on the Broadalbin soils, but many acres of these soils are free of stones. Lime and fertilizer applications are needed for all crops, and response is generally excellent.

The soils in this unit require careful management to reduce crusting, erosion, and compaction below the surface. Good soil structure is difficult to maintain and plowing or fitting should not be done when these soils are wet. Keeping tillage to a minimum, using a cropping system that includes an occasional sod crop, returning crop residue to the soil, and using winter cover are measures for maintaining tilth.

Drainage of wet spots by surface smoothing and the use of random tile drainage systems help make the soils of this unit more useful for all crops. Irrigation water should be applied at a moderate rate and carefully managed to prevent surface sealing, compaction, and serious loss of soil and water.

CAPABILITY UNIT IIe-7

This unit consists of deep, medium-textured, gently sloping, gravelly soils of the Herkimer and Palmyra series. These soils formed in glacial outwash deposits on terraces and fans. Soils of this unit are generally well drained, but in places the Palmyra soils are excessively drained.

The soils of this unit are medium to high in content of lime and moderate to low in natural fertility. Available water capacity is moderate. The hazard of erosion is slight to moderate if these soils are cultivated and left unprotected. In places, the Palmyra soils have complex slopes on which the use of contouring to control runoff and erosion is not feasible.

The soils of this unit are generally more valuable for rotation crops than for permanent cover crops. They are well suited to early planted crops and vegetables, and to varieties of alfalfa that require good drainage and a deep rooting zone. Surface gravel and stones may interfere with the use of machinery for planting and cultivating in places. Although lime content increases with depth, moderate amounts are needed on the surface soil for most crops. Annual applications of fertilizer also are needed.

Using measures to control erosion permits more intensive use of these soils. Contouring can be used on the longer uniform slopes for erosion control. A cropping system that includes a sod crop can be used on undulating areas where contour measures are not practical. These soils are also suited to a system of crop residue management combining no-plow with minimum tillage. Such cropping systems effectively maintain the content of organic matter and preserve good tilth.

These soils are excellent for irrigated crops because infiltration is rapid and the danger of crusting is slight to nonexistent. Erosion can occur, however, and water can be wasted, if these soils are carelessly irrigated.

CAPABILITY UNIT IIw-1

This unit consists of deep, level to very gently sloping, moderately well drained soils of the Herkimer, Lima, Phelps, and Williamson series. All of these soils are medium textured except Phelps, which is moderately coarse in texture. The Herkimer and Phelps soils formed in gravelly outwash. The Lima soils are on till uplands. The Williamson soils formed in deposits of wind- or water-sorted silt and very fine sand. They have a fragipan 15 to 27 inches below the surface that restricts water movement and rooting.

The Herkimer and Phelps soils in this unit are medium to high in content of lime and moderate to low in natural fertility. Available water capacity is moderate to low. The Lima soils are high in content of lime and moderate to high in natural fertility. Available water capacity is moderate. The Williamson soils are very low to medium in content of lime and moderate to low in natural fertility. Available water capacity is moderate to high.

If properly managed, the soils of this unit are well suited to all crops grown in the county. The soils are easy to work. Slight wetness in places delays planting briefly in spring. Gravelly and cobbly fragments in the Herkimer and Phelps soils may interfere with the machinery used to till truck crops in places. Crops respond to nitrogen fertilizer applied early in spring, when these soils tend to be cold and wet. More lime is needed on the Williamson soils than on the other soils in this unit.

These soils can be intensively cultivated if supported by a high level of management. Keeping tillage to a minimum and planting a sod crop every 4 to 5 years help preserve soil structure. Returning crop residue to the soil and growing cover crops are also good supporting practices. On the fields that erode, contouring and terracing permit more intensive use of the soils.

Random surface drainage and random tile in wet spots improve fields for more efficient production of high quality crops.

CAPABILITY UNIT IIw-2

This unit consists of deep, medium-textured and moderately coarse textured, level and nearly level, moderately well drained to somewhat poorly drained soils of the Teel series. These soils formed in alluvium on flood plains and are subject to occasional overflow.

The soils of this unit are medium to high in content of lime and moderate to high in natural fertility. Available water capacity is high.

The soils in this unit are suited to all types of crops grown in the county. Flooding and the high water table early in spring, however, restrict the choice of some crops. Crops grown on these soils should be tolerant of short periods of wetness in the spring. Short-season crops and annual forage crops do well.

These soils respond very well to applications of lime and fertilizer. Maintaining tilth and the content of organic matter, and controlling erosion, are seldom difficult. These soils are easy to work. In some places land shaping is needed to improve surface drainage. Winter cover is desirable. The improvement and maintenance of existing stream channels, along with levees, helps control flooding in places where it is a problem.

These soils are well adapted to irrigation because of their proximity to water sources, and their depth and permeability.

CAPABILITY UNIT IIs-1

This unit consists of deep, medium-textured and moderately coarse textured, well-drained to somewhat excessively drained, gravelly soils of the Howard series. These soils are level to gently sloping. They formed in gravelly glacial outwash on terraces, kames, and deltas.

The soils of this unit are medium in content of lime and moderate to low in natural fertility. Available water capacity is moderate to low. These soils are slightly droughty during extended dry periods. The hazard of erosion is slight on the gently sloping or undulating soils if they are left unprotected.

Soils of this unit are well suited to all crops commonly grown in the county, including vegetables and deep-rooted crops. Shallow-rooted crops are damaged occasinally by drought. These soils are easy to work and can be planted early, and crops on them respond well to good management. Surface gravel may interfere with the operation of the precision machinery used for cultivating and harvesting vegetable crops in places.

Fertilizer and lime are needed for good response. Row crops can be grown repeatedly if favorable soil structure and organic matter are maintained. Organic matter should be returned to the soils by using crop residue and cover crops, and by including an occasional year of sod in the rotation.

Erosion is a minor problem. Contour measures can be used on the longer, uniform slopes. A cropping system that includes growing sod crops, keeping tillage to a minimum, and maintaining plant residues on the surface can be used where slopes are undulating or on large fields where contouring is not feasible or desired.

These soils are excellent for irrigated crops because they provide rapid infiltration and have little or no crusting or sealing. They can be cultivated soon after irrigation with little or no compaction.

CAPABILITY UNIT IIs-2

Wassaic silt loam, 0 to 3 percent slopes, is the only soil in this unit. It is a well-drained, medium-textured, level to nearly level soil on uplands. Limestone bedrock is 20 to 40 inches below the surface.

This soil is medium to high in content of lime and moderate to high in natural fertility. Available water capacity is moderate. Shallower areas are droughty. Erosion is not a problem.

This soil is suited to most crops commonly grown in the county. Moisture conditions are spotty and vary with the depth to underlying bedrock. Lime and fertilizer are needed for good crop response. Several consecutive years of row crops can be grown if tillage is kept to a minimum and crop residues are returned to the soil. A cropping system that includes a sod crop or green manure crop in the rotation helps maintain soil structure. Depth to bedrock restricts the use of tile systems for draining wet areas.

Using killed sod or crop residue in a no-plow system of management helps conserve water that is received as natural rainfall. This soil can also be irrigated.

CAPABILITY UNIT IIIe–1

This unit consists of medium-textured, moderately sloping soils of the Canton, Honeoye, Lansing, Mohawk, Palatine, Ontario, and Wassaic series. These soils are on uplands. The Canton, Honeoye, Lansing, Mohawk, and Ontario soils are deep, and the Palatine and the Wassaic soils extend to a depth of 20 to 40 inches. The Palatine soils are underlain by dark calcareous shale, and the Wassaic soils by jointed limestone bedrock. Soils of this unit are generally well drained, but in places Mohawk soils are moderately well drained and Palatine soils are somewhat excessively drained.

All of the soils in this unit except Canton are high or medium in content of lime and moderate to high in natural fertility. Canton soils are low in content of lime and low to moderate in natural fertility. Available water capacity ranges from high to moderate in the soils of this unit. Runoff is rapid and the hazard of erosion is moderate to severe if these soils are left unprotected.

Soils of this unit are suited to most crops grown in the county. Row crops should be kept to a minimum in the cropping system, unless erosion-control measures are used. Most of the soils contain lime; but more is needed in cultivated areas, and fertilizer is needed for all crops. A few large stones are on the surface of Canton soils and interfere slightly with tillage.

In fields where slopes are long enough, stripcropping, grassed waterways, and diversions permit more intensive use of the soils, and tile drainage helps in wet spots. Depth to bedrock in Palatine and Wassaic soils restricts the use of tile and diversions. On these soils other control measures should be used, such as a cropping system that has additional years of sod crops, and crops that provide winter cover. Row crops can be grown safely if tillage is kept to a minimum and crop residue is retained on the surface.

In places on steeper slopes the use of precision farm machinery is difficult, and the use of irrigation systems for specialized crops is curtailed. It is important to intercept both seepage and surface runoff water on soils of this unit before such water descends to areas of less steep, more poorly drained soils.

CAPABILITY UNIT IIIe–2

This unit consists of deep, medium-textured and moderately coarse textured, moderately sloping, gravelly soils of the Howard and Palmyra series. These soils formed in glacial outwash on terraces, fans, and kames. Howard soils are well drained to somewhat excessively drained, and Palmyra soils are well drained to excessively drained.

Soils of this unit are medium and high in content of lime. They are moderate to low in natural fertility. Available water capacity is moderate to low in Howard soils and moderate in Palmyra soils. Runoff is moderate to rapid and the hazard of erosion is moderate to severe if these soils are left unprotected.

Soils of this unit are suited to most crops grown in the county. They tend to be droughty because of moderate to rapid runoff, and measures to conserve moisture and control erosion are needed. These soils are well suited to alfalfa and other deep-rooted crops. Lime and fertilizer are needed for good crop response. Surface gravel and slope interfere with machine operations in places.

Sod-based rotations and other erosion-control practices permit cultivation of these soils. Contouring, contour stripcropping, and maintaining crop residue on the surface all year permit the most intensive use. Keeping tillage to a minimum and using a no-plow crop management system with crop residue help protect these sloping soils when row crops are grown.

Irrigation on the bare surface of the soils of this unit should be carefully controlled and kept to a minimum to avoid accelerated soil and water loss.

CAPABILITY UNIT IIIe–3

This unit consists of deep, medium-textured, moderately sloping soils of the Broadalbin, Hartland, and Agawam series. Broadalbin soils are well drained and moderately well drained. They formed in sorted silty or loamy deposits over till on uplands, and have a fragipan 18 to 36 inches below the surface that restricts water movement and rooting. Hartland and Agawam soils are well drained. They formed in sorted silty and sandy deposits on smoothly sloping or rolling stream terraces and lake plains.

The soils of this unit are very low to medium in content of lime and low to moderate in natural fertility. Available water capacity is moderate to high in the Broadalbin and high in the Hartland and Agawam soils. These soils are subject to soil blowing, and the hazard of water erosion is severe if they are left unprotected.

If properly managed the soils of this unit are well suited to all crops commonly grown in the county. Applications of lime and fertilizer are needed, and response is generally excellent.

Due to the erodible nature of the soils, the length of time they remain bare should be kept to a minimum. Use of contouring, contour stripcropping, grassed waterways, crop residue, and winter cover crops is successful in controlling soil and water loss. The use of contour erosion-control methods on the Hartland and Agawam soils is not always feasible because of complex slopes. In these situations sod crops should be favored in cropping systems. Care must be exercised to maintain good tilth. Tillage should be kept to a minimum because soil structure breaks down easily with frequent tillage. Severe erosion, crusting, loss of organic matter, and plowpans develop with overtillage. Drainage of wet areas is helpful for efficient field management. Irrigated areas require careful management to prevent serious soil and water loss.

CAPABILITY UNIT IIIe-4

This unit consists of deep, medium-textured, moderately sloping, moderately well drained soils of the Bombay, Hilton, and Lima series. These soils are on upland till landscapes.

Soils of this unit are medium to high in content of lime. Natural fertility is moderate to high in all the soils of this unit except Bombay, where it is low in places. Available water capacity of Hilton and Lima soils is moderate and that of Bombay soils is moderate to high. Runoff is rapid and the hazard of erosion is moderate to severe.

If properly managed, these soils are well suited to most crops grown in the county. Wetness early in spring delays planting briefly in places.

Lime needs vary, but some lime is needed for most crops. Fertilizers also are needed. The ability of these soils to hold and supply applied nutrients is very good.

Soils of this unit often have long slopes and they erode easily where water concentrates and where they are cultivated frequently without protective erosion-control measures. Use of contour stripcropping and grassed waterways and diversions generally is effective in controlling erosion. If the soils of this unit are cultivated often, management on slopes should include keeping tillage to a minimum, not plowing when the soil is wet, and returning crop residue to the soil. These soils crust easily unless irrigation water is applied at moderate rates. Maintaining large amounts of crop residue on the soil surface reduces crusting.

CAPABILITY UNIT IIIe-5

This unit consists of medium-textured, moderately sloping soils of the Hudson and Lairdsville series. These soils generally are moderately well drained, but the Lairdsville soils are well drained in places. The Hudson soils are deep and formed in clayey lacustrine sediment over till or outwash. The Lairdsville soils formed in thin till deposits derived mainly from underlying silty red shale 20 to 40 inches below the surface.

Soils of this unit are high or medium in content of lime and moderate to high in natural fertility. Available water capacity is moderate to high. Runoff is rapid and the hazard of erosion is severe.

The soils of this unit are suited to most field crops commonly grown in the county. Slight wetness delays planting briefly in places in spring. Lime and fertilizer applications are needed for good crop response.

These soils are subject to severe erosion when frequently cultivated. Rotations and conservation measures are needed to control loss of soil and water. Use of contouring, contour stripcropping, grassed waterways, and diversions or terraces to shorten slopes all help provide safe water disposal. A cropping system that includes keeping tillage to a minimum and maintaining crop residue on the soil is effective in protecting these soils. Working the land when the plow layer is too wet can lead to puddling and crusting that will require a grass and legume sod to correct. It also compacts the upper part of the subsoil. Growing deep-rooted crops helps correct this problem.

Drainage of wet spots by land shaping and random tile improves the efficiency of field operations. Irrigation is complicated by slope and the hazards of crusting, puddling, and increased runoff and erosion.

CAPABILITY UNIT IIIe-6

This unit consists of medium-textured, moderately sloping soils of the Burdett, Hornell, and Manheim series. These soils are on till uplands. They are generally somewhat poorly drained, but in places the Hornell soils are moderately well drained. The Burdett and Manheim soils are deep. They formed in glacial till. The Hornell soils formed in thin till or partially in residuum from underlying clayey shale bedrock 20 to 40 inches below the surface.

The Burdett and Manheim soils are medium to high in content of lime and moderate to high in natural fertility. The Hornell soils are very low in content of lime and moderate in natural fertility. Available water capacity is moderate in the Burdett and Hornell soils and moderate to high in the Manheim soils. Runoff is rapid and the hazard of erosion is severe if these soils are cultivated and left unprotected.

Soils of this unit are suited to many common field crops if erosion is controlled and the soils are effectively drained. More lime is needed on the Hornell soils than on the Burdett and Manheim soils. Fertilizers also are needed for good crop response. Row crops need to be combined in the rotation with sod and cover crops and winter cover to reduce water erosion. An effective system of water management and erosion control should include diversions, stripcropping, crop rotation, minimum tillage, and the return of crop residue to the soil. Drainage of wet areas also aids in field management.

If conservation practices are not used, these soils are better suited to hay and forage crops such as birdsfoot trefoil and timothy, which tolerate some wetness.

CAPABILITY UNIT IIIe-7

Manlius shaly silt loam, 8 to 15 percent slopes, is the only soil in this unit. This is a medium-textured, well-drained to excessively drained soil on uplands. It formed in thin till derived mainly from underlying shale bedrock 20 to 40 inches below the surface.

This soil is very low in content of lime and low to moderate in natural fertility. Available water capacity is low to moderate. The hazard of erosion is severe if the soil is cultivated and left unprotected.

If this soil is carefully managed, it is suited to most crops commonly grown in the county. Large amounts of lime are needed for the successful cultivation of legumes, and fertilizer is needed for all crops. Shale fragments on the surface influence the selection of some in places. Deep-rooted hay crops are better suited.

The use of this soil for cropping is limited somewhat by lack of moisture caused by slope and moderately shallow depth to bedrock. Careful management and protection from loss of soil and water are needed.

Contouring, contour stripcropping, returning crop residue to the soil, and growing crops that provide winter cover are various methods of protecting the soil surface and conserving available rainfall. A cropping system that incorporates the principle of no-plow minimum tillage can be used to control erosion and manage water on the soil of this unit. Although this soil needs supplemental water in places, the feasibility of irrigation is questionable because of moderate soil depth and availability of water in the bedrock.

CAPABILITY UNIT IIIw-1

This unit consists of deep, level and nearly level soils of the Appleton, Burdett, Fredon, Manheim, and Raynham series. The Appleton, Burdett, and Manheim soils are medium in texture. They formed in till on uplands. Fredon soils are moderately coarse in texture. They formed in gravelly glacial outwash. Raynham soils are medium in texture. They formed in water-sorted deposits of silt and very fine sand. The soils of this unit are generally somewhat poorly drained, but the Fredon and Raynham soils range from somewhat poorly drained to poorly drained.

The Appleton, Burdett, and Manheim soils are medium or high in content of lime and moderate to high in natural fertility. Fredon soils are medium to high in content of lime and Raynham soils are medium. Fredon and Raynham soils are moderate to low in natural fertility. Available water capacity is moderate to high in the Appleton and Manheim soils, moderate in the Burdett soils, low to moderate in the Fredon soils, and high in the Raynham soils. Excess water is one of the main limitations to farming these soils.

The soils of this unit are suited to many common field crops and most vegetables, if they are effectively drained and adequately limed and fertilized. Although content of lime increases with depth, some additional lime is needed for selected crops.

Row crops can be grown continuously, but it is important to return all crop residue to the soil. Using a rotation that includes an occasional sod or annual green manure crop and keeping tillage to a minimum help maintain soil structure.

Excess water must be removed from these soils before they can be successfully managed for cultivation. Both tile and open ditch drainage systems can be used, but they must be carefully designed and installed. In most areas, land smoothing can be an effective surface drainage measure. Runoff water from adjacent areas should be diverted from the soils in this unit.

Irrigation needs to be carefully controlled to avoid damage and sealing of the soil surface. In undrained areas these soils are better suited to forage crops, such as birdsfoot trefoil and timothy, that can tolerate some wetness.

CAPABILITY UNIT IIIw-2

This unit consists of deep and moderately deep, level to very gently sloping soils of the Hornell, Lockport, and Rhinebeck series. These soils have a medium-textured surface layer and a fine textured or moderately fine textured subsoil. The Hornell and Lockport soils are moderately deep and formed in thin till derived mainly from underlying shale bedrock 20 to 40 inches below the surface. The Rhinebeck soils are deep and formed in clayey lacustrine sediments over till or outwash. Soils of this unit are generally somewhat poorly drained, but in places the Hornell soils are moderately well drained.

Hornell soils are very low in content of lime; Lockport soils are low to high and Rhinebeck soils are medium to high. Natural fertility is moderate in the Hornell soils, and moderate to high in the Lockport and Rhinebeck soils. Available water capacity is moderate in the Hornell and Rhinebeck soils and low to moderate in the Lockport soils. Seasonal wetness is one of the principal limitations to farming these soils.

The soils of this unit generally must be drained before they can be planted to cultivated row crops. If drainage is impractical, these soils should be planted to grass species for forage that can tolerate a high water table. They should be fertilized annually with complete fertilizers high in content of nitrogen. Lime also is needed for all crops.

These soils should be planted to a sod crop at least one year for every three years they are plowed, unless annual cover crops are planted with all crop residue returned to the soil. Depth to bedrock limits the use of tile for internal drainage in places. Surface drainage to remove pockets of water is generally justified. Runoff from higher land should be diverted to safe outlets.

Careful tilth management is essential for moderately intensive use of these soils. The soils should be plowed only when soil moisture is moderate or low. Fall plowing is sometimes desirable. These soils tend to crust over rapidly when irrigated. The rate of application should be moderate. Traffic also must be restricted when these soils are wet.

CAPABILITY UNIT IIIw-3

This unit consists of deep, medium-textured soils of the Appleton, Burdett, Manheim, and Massena series. These soils are on uplands. They are mostly gently sloping and somewhat poorly drained, but in places the Massena soils are level and nearly level and poorly drained.

All the soils of this unit are medium or high in content of lime. All except Massena are moderate to high in natural fertility. In places, the Massena soils are low in natural fertility. Available water capacity is moderate to high in the Appleton and Manheim soils, moderate in the Burdett soils, and moderate to low in the Massena soils. Excess water is one of the principal limitations to farming these soils. Erosion is a hazard on the gently sloping soils of this unit if they are cultivated and left unprotected.

The soils of this unit are well suited to common field crops if they are effectively drained and adequately limed and fertilized. Although content of lime increases with depth, some additional lime is needed for selected crops. Nitrogen fertilizer is useful if applied in the spring. Early wetness delays planting in places. Frequent row crops can be included in the rotation, but crop residue must be returned to the soil. Keeping tillage to a minimum and using a rotation that includes sod and winter cover crops help maintain soil structure.

Excess water must be removed safely to maintain crop growth. Diversions, waterways, and stripcropping can be combined to control water and minimize soil loss when these soils are cultivated. Drainage of wet spots helps make field management more efficient.

Undrained, unprotected soils of this unit should be planted to permanent forage crops such as birdsfoot trefoil and timothy.

CAPABILITY UNIT IIIw-4

This unit consists of medium-textured, gently sloping soils of the Hornell and Rhinebeck series. These soils have a fine textured or moderately fine textured subsoil. The Hornell soils are moderately deep. They formed in thin till derived mainly from underlying shale bedrock 20 to 40 inches below the surface. The Rhinebeck soils are deep. They formed in clayey lacustrine sediment over till or outwash. The soils of this unit are generally somewhat poorly drained, but in places the Hornell soils are moderately well drained.

Hornell soils are very low in content of lime and moderate in natural fertility. Rhinebeck soils are medium to high in content of lime and moderate to high in natural fertility. Available water capacity is moderate. Seasonal wetness is one of the main limitations to farming these soils. Erosion is a hazard if the soils are cultivated and left unprotected.

If carefully managed, the soils of this unit are suited to common field crops. If intensively used, the soils require special practices to improve water disposal, control erosion, and maintain the supply of organic matter. The Hornell soils are strongly acid, and the Rhinebeck soils are slightly acid in the surface layer, so lime is needed. Fertilizer is needed for all crops.

Diversions, waterways, drainage of wet spots, and surface drainage are various useful methods of water disposal. Contouring, returning plant residue to the soil, and keeping tillage to a minimum can be combined with these water disposal methods for effective soil and water management.

The soils of this unit should not be cultivated or worked when wet, since they puddle and crust easily. Sod crops and the frequent return of plant residue are needed to control this problem. Soils of this unit that are unprotected can be used for the production of water-tolerant forage plants, and for a high-nitrogen fertility program.

CAPABILITY UNIT IIIw-5

Mosherville very fine sandy loam, 2 to 8 percent slopes, is the only soil in this unit. This is a deep, nearly level to gently sloping, somewhat poorly drained soil on uplands. It formed in silty surficial mantle and glacial till. A slowly permeable fragipan, 14 to 30 inches below the surface, restricts water movement and rooting.

This soil is low in content of lime and moderate to low in natural fertility. Available water capacity is moderate. Seasonal wetness is one of the main limitations to farming this soil. The hazard of erosion is moderate to severe on the more sloping areas if the soil is cultivated and left unprotected.

If properly managed, the soil of this unit is suited to all crops commonly grown in the county. In places, seasonal wetness delays planting in spring. In places stones are on the surface and interfere with precision cultivating and harvesting machinery. Content of lime increases with depth, but additional lime is needed for all crops. Fertilizer also is needed.

This soil is well suited to the use of diversions as part of a water management system. Diverting water from the higher, better drained soils away from this soil is helpful. Erosion is a hazard, and combining contouring and contour stripcropping with diversions helps control soil and water loss. Including sod crops in the rotation, returning crop residue to the soil, and keeping tillage to a minimum help maintain tilth. Water intake is slow, and this soil should not be cultivated when wet because it seals over and crusts. Unless conservation practices are applied, this soil is better suited to long rotations of forage plants that are tolerant of wetness.

CAPABILITY UNIT IIIw-6

Wayland silt loam is the only soil in this unit. It is a deep, level or nearly level soil on flood plains. Drainage is poor or very poor. This soil is subject to flooding but rarely floods during the growing season.

The soil of this unit is medium to high in content of lime and moderate in natural fertility. Available water capacity is moderate. Excess water and the hazard of flooding are the main limitations to farming this soil.

The soil of this unit is suited to row crops only when effectively drained, but drainage outlets are difficult to locate in some areas. It is best suited to annual forage crops and permanent sods of plants that are tolerant of wetness. The need of this soil for lime varies from place to place; and although lime content increases with depth, applications of both lime and fertilizer are needed.

Cultivated crops can be included frequently in the rotation if the soil is carefully managed to maintain tilth. Outlet ditches and occasional tile in depressions are needed to improve this soil. Surface drainage of shallow pockets is also needed to make the field more uniform and cultivation more efficient. In areas along streams, channel improvement and the use of levees for flood protection are helpful. This soil should not be cultivated when wet, because the surface compacts easily. Including occasional sod crops in the rotation, returning crop residue to the soil, and keeping tillage to a minimum are helpful in maintaining soil tilth. Irrigation is not generally feasible because of the moderately slow rate of intake and prolonged wetness after rains.

Surface-drained fields planted to forage species that are tolerant of periods of flooding will produce well in the summer when production from fields of better drained soils is reduced. Early pasturing can result in damage by trampling. Forage production can be maintained by fertilizing annually.

CAPABILITY UNIT IIIs-1

This unit consists of excessively drained, deep, nearly level and gently sloping, coarse-textured soils of the Windsor series.

The Windsor soils are very low in content of lime and in natural fertility. Available water capacity ranges from very low to moderate. These soils are droughty. The hazard of erosion is slight on the more sloping areas, but the Windsor soils are subject to soil blowing if left unprotected.

The soils of this unit are best suited to deep-rooted crops. Their use for general crops and shallow-rooted crops is limited unless supplemental water is supplied. These soils are easy to cultivate, but frequent cultivation often results in damage from soil blowing.

Lime and fertilizer are easily lost by leaching. Applications should be made annually and at the time plants can make best use of them. Permanent pasture and hay areas can be treated in early spring so that harvests are completed before drought begins. A cropping system that includes winter cover and the return of plant residue to the soil is most helpful in controlling soil blowing and conserving available moisture.

Irrigation water can be applied rapidly, but the amounts of water should be carefully controlled so that fertilizer nutrients are not lost through excessive leaching.

CAPABILITY UNIT IIIs-2

This unit consists of nearly level and gently sloping, well-drained and somewhat excessively drained soils of the Farmington and Nassau series. These soils formed in thin till deposits on uplands. The Farmington soils are 10 to 30 inches thick over jointed limestone bedrock and the Nassau soils are 8 to 20 inches thick over shale bedrock. Scattered rock outcrops are in some areas, especially in areas of Farmington soils.

The Farmington soils of this unit are medium in content of lime, and the Nassau soils are very low in content of lime. These soils are low to moderate in natural fertility. Available water capacity is low or very low. These soils are droughty. Erosion is a hazard on sloping areas where these soils are frequently cultivated.

Soils of this unit are suited to most crops commonly grown in the county. Crops are affected, however, by the lack of depth for moisture reserve during dry periods. Crops that mature early or can withstand dry periods are generally more practical. All rotations should include sod crops, and the maximum intensity of use without protective conservation measures should not exceed one year of cultivation to four years of sod.

Lime and fertilizer are needed for best crop response. Contour cultivation or stripcropping on slopes of more than 3 percent, and the use of crop residues and cover crops, help conserve soil and water. A cropping system that keeps tillage to a minimum and keeps plant residue on the surface all year also helps conserve soil and water.

CAPABILITY UNIT IVe-1

This unit consists of medium-textured, moderately steep, upland soils of the Honeoye, Lansing, Mohawk, Ontario, Palatine, and Wassaic series. All of these soils except Palatine and Wassaic are deep. The Palatine and Wassaic soils are moderately deep. Also in this unit are deep, moderately steep, medium-textured and moderately coarse textured, gravelly soils of the Howard and Palmyra series. They are on glacial outwash terraces, kames, and fans.

All of the soils of this unit are medium or high in content of lime. Natural fertility is generally moderate to high but is low in some areas of the coarser textured Howard and Palmyra soils. Available water capacity is moderate or high in the deep Honeoye, Lansing, Mohawk, and Ontario soils, and ranges to low in the Howard, Palmyra, Palatine, and Wassaic soils. Runoff is rapid and plants show moisture stress sooner than on less sloping areas of these soils. The hazard of erosion is severe if the soils are left unprotected.

The soils of this unit generally are not suited to cultivated crops. Moderately steep slopes, surface stones, and bedrock interfere with the machinery for planting and cultivation in places. Measures are needed to conserve water. Mixtures of deep-rooted crops for hay and pasture do well on these soils.

Limited contour tillage for reseeding can be performed on uniform slopes to conserve water and soil. A high level of fertility should be maintained.

CAPABILITY UNIT IVe-2

This unit consists of deep, rolling, well-drained to excessively drained soils of the Palmyra series and well-drained to somewhat excessively drained soils of the Howard series. They have a medium-textured or moderately coarse textured, gravelly surface layer, and formed in gravelly glacial outwash on kames and kame terraces.

The Palmyra soils of this unit are high in content of lime and the Howard soils are medium. Natural fertility is moderate to low. Available water capacity is moderate to low. The hazard of erosion is moderate if these soils are left unprotected. Droughtiness limits the use of these soils in places.

The soils of this unit are suited to all crops commonly grown in the county. Slopes are complex, however, and contour measures are not feasible for erosion control or water conservation. Sod-based rotations that include deep-rooted crops like alfalfa should be used. Although lime content increases with depth, surface soils are acid in places and lime and fertilizer are needed.

Crop residue should be left on the soil surface all year to control erosion. Keeping tillage to a minimum and growing crops that provide winter cover are also helpful.

Irrigation on these soils should be carefully controlled to avoid accelerated soil and water loss.

CAPABILITY UNIT IVe-3

This unit consists of deep, medium-textured, moderately steep soils of the Broadalbin, Hartland, and Agawam series. The Broadalbin soils are well drained to moderately well drained. They formed in sorted silty or loamy deposits over till on uplands. They have a fragipan 18 to 36 inches below the surface that restricts water movement and rooting. Hartland and Agawam soils are well drained. They formed in sorted silty and sandy deposits and are on smoothly sloping or hilly landscapes of stream terraces and lake plains.

The soils of this unit are very low to medium in content of lime and low to moderate in natural fertility. Available water capacity is moderate to high in the Broadalbin soils and high in the Hartland and Agawam soils. These soils are subject to soil blowing and the hazard of water erosion is very severe if they are left unprotected.

The soils of this unit are best suited to close-growing and sod-forming crops. Wheat, oats, and deep-rooted perennial legumes can be included in the rotation for long periods on these sloping soils. Occasional row crops can be grown safely if slopes are protected from erosion. Slope may limit some field operations on row crops. Content of lime increases with depth, but additional lime and fertilizer are needed for crops.

Old pastures can be improved by adding lime and fertilizer. Long-term rotation pastures, however, produce better and are better for erosion control.

Deep-rooted legumes produce better in midsummer, and shallow-rooted legumes produce better in spring.

CAPABILITY UNIT IVe-4

This unit consists of medium-textured, moderately steep soils of the Hudson and Lairdsville series. The Hudson soils are deep and formed in clayey lacustrine sediment over till or outwash. The Lairdsville soils formed in thin till deposits derived mainly from underlying silty red shale at a depth of 20 to 40 inches. Soils of this unit are generally moderately well drained, but the Lairdsville soils are well drained in places.

Soils of this unit are high or medium in content of lime and moderate to high in natural fertility. Available water capacity is moderate to high. Runoff is very rapid and the hazard of erosion is very severe if the soils are left unprotected.

Cultivation of the soils of this unit is severely limited by slope and the hazard of erosion. The soils are well suited to deep-rooted plants for hay and pasture. Lime and fertilizer applications are needed. Harvesting is difficult on some slopes. Crop residue should be left on the soil surface to increase infiltration of available rainfall and keep loss of soil and water to a minimum.

CAPABILITY UNIT IVe-5

This unit consists of medium-textured soils of the Manlius and Nassau series. The Manlius soils are moderately deep, and the Nassau soils are shallow. These soils formed in thin till derived mainly from underlying shale bedrock, at a depth of 20 to 40 inches. The Manlius soils of this unit are moderately steep, and the Nassau soils are sloping and moderately steep. These soils are well drained to excessively drained.

The soils of this unit are very low in content of lime and low to moderate in natural fertility. Available water capacity is low to moderate in the Manlius soils and low or very low in the Nassau soils. Runoff is rapid or very rapid, and these soils are droughty. The hazard of erosion is very severe if the soils are left unprotected.

Steepness and shallowness make the soils of this unit unsuited for general cultivated crops. Crops that mature early or can withstand dry periods are more practical. Lime and fertilizer are needed for all crops. Early spring applications of nitrogen fertilizer on grass sod makes use of available moisture more efficient for early pasture or hay. Occasional row crops can be grown if measures are taken to control loss of water and soil. A cropping system that maintains plant residue on the surface, with no-plow minimum tillage, is another protective measure.

Irrigation is restricted by slope, depth to bedrock, and lack of available water.

CAPABILITY UNIT IVw-1

This unit consists of deep, poorly drained and very poorly drained, level and nearly level soils of the Halsey, Ilion, Lamson, Lyons, and Sun series. These soils are in depressed areas where runoff water accumulates and remains for long periods. The Ilion, Lyons, and Sun soils formed in till on uplands. The Halsey soils formed in gravelly glacial outwash, and the Lamson soils in sandy lacustrine sediment.

The soils of this unit are medium and high in content of lime. All the soils of this unit except Ilion and Lyons are moderate to low in natural fertility. The Ilion and Lyons soils are moderate to high in natural fertility. Available water capacity of the normal root zone in these soils is low to moderate, but the water table persists at or near the surface for such long periods that there is more than enough water available for plant growth.

Unless drained, these soils are too wet for cultivation. Response to tile drainage is generally excellent in areas where outlets are available. Open ditches, surface drainage, land shaping, or some combination of these, with tile to remove water held in pockets, is needed. Special care is needed when tile is installed to prevent plugging with silt and fine sand. If adequately drained, these soils are suited to all crops grown in the county. Row crops can be grown continuously. Supporting practices, such as growing cover crops, keeping tillage to a minimum, and returning all crop residue to the soil, help maintain organic-matter content and a friable surface soil.

In undrained areas of these soils, annual applications of complete fertilizer on grass sods that are tolerant of wetness and ponding result in good forage production. Forage crops can be better managed if water from higher land can be diverted away from these soils. Plowing, preparation of seedbeds, and seeding should be done during the dry periods of summer months. High-value crops on these soils need supplemental irrigation in places for maximum returns.

CAPABILITY UNIT IVw-2

Allis silt loam is the only soil in this unit. It is a poorly drained to somewhat poorly drained, medium-textured soil that has a moderately fine textured to fine textured subsoil. It is level to nearly level, and formed on uplands in thin till or partly in residuum derived mainly from shale bedrock at a depth of 20 to 40 inches.

This soil is very low in content of lime and moderate in natural fertility. Available water capacity is moderate to low.

The difficulty of providing adequate outlets for drainage limits the use of the soil of this unit for cultivated crops. Row crops cannot be grown unless the soil is drained. Lime and fertilizer applications are needed for best response.

Drainage ditches and surface drainage to remove water from low spots permit the growth of forage plants that are tolerant of periods of wetness. If this soil is well fertilized with nitrogen, it is well suited to these forage plants. The soil can also be used for crops that provide summer forage, especially in dry years.

CAPABILITY UNIT IVs-1

This unit consists of deep, excessively drained soils of the Hinckley and Windsor series. They formed in gravelly and sandy glacial water deposits. The Hinckley soils are nearly level and gently sloping, and the Windsor soils are moderately sloping. These soils are on glacial outwash terraces, kames, and deltas.

Content of lime in the Hinckley soils is very low or low, and in the Windsor soils very low. Both soils are low in natural fertility. Available water capacity is very low or low in the Hinckley soils and very low to moderate in the Windsor soils. These soils are droughty. Erosion is a hazard on the more sloping areas. These soils, especially the Windsor soils, are subject to soil blowing if left unprotected.

The soils in this unit are best suited to deep-rooted crops because of the hazard of drought. Soil surfaces

Lime and fertilizer are rapidly leached from these soils, and applications are needed annually. Additional fertilizer should be applied at the time the particular crop grown can make the best use of it.

A cropping system that retains plant residue on the soil surface all year permits the most efficient use of available water and fertility. Plant residue left on the surface also protects the soil from blowing and helps stabilize the steeper slopes. Winter cover is very helpful.

Irrigation water can be applied at a rapid rate, but care must be taken to avoid loss of both water and fertility by excessive leaching.

CAPABILITY UNIT VIe-1

This unit consists of deep, medium-textured, steeply sloping soils of the Honeoye and Lansing series. These soils formed in glacial till on uplands.

The Honeoye soils are high in content of lime and the Lansing soils are moderate in content of lime. All the soils of this unit are moderate to high in natural fertility. Available water capacity is high to moderate. Runoff is rapid and the hazard of erosion is severe if these soils are left unprotected.

These soils are too steep for crops and for the safe use of farm machinery. Open areas are suited to pasture, and the less steep slopes can be renovated and seeded to forage mixtures that include deep-rooted perennial legumes.

Applications of fertilizer and lime are needed. Grazing management should include the maintenance of a protective cover at all times.

CAPABILITY UNIT VIw-1

Cohoctah mucky very fine sandy loam is the only soil in this unit. It is a deep, poorly drained and very poorly drained soil that has a medium-textured surface layer and a moderately coarse textured subsoil. It is level or nearly level, and formed in recent alluvium on flood plains.

This soil is medium to high in content of lime and moderate to low in natural fertility. Available water capacity is moderate but normally there is more than enough moisture for plant growth. The water table is at or near the surface for much of the year. This soil is subject to flooding.

In its natural condition, this soil is not suited to any crop because of wetness and the hazard of flooding. Lime is not generally needed in this unit, and fertilizer applications should be restricted to areas that are improved by drainage.

If this soil is drained, it can be farmed in rotation with adjacent soils. If partly protected, the soil can be used for pasture, especially in summer. Areas that are frequently flooded are not generally worth attempting to improve by drainage or fertilization.

CAPABILITY UNIT VIs-1

This unit consists of deep, nearly level to moderately steep, very stony soils of the Honeoye and Mohawk series. These soils are generally well drained, but in places the Mohawk soils are moderately well drained. Stones more than 10 inches in diameter are scattered about 5 to 30 feet apart on the surface.

The soils of this unit are high in content of lime and moderate to high in natural fertility. Available water capacity is high to moderate in the Honeoye soils and high in the Mohawk soils.

These soils are too stony for cultivation with modern farm equipment. Selected areas can be topdressed with complete fertilizer and used for pasture. Hand seeding of birdsfoot trefoil improves production. Practices for management of grazing should be used on improved areas to maintain stands and production.

CAPABILITY UNIT VIIe-1

This unit consists of deep, steep and very steep soils of the Palmyra, Howard, Hinckley, and Windsor series. These soils formed in gravelly and sandy glacial outwash on terraces, kames, and deltas.

Lime content ranges from high in the Palmyra soils to very low in the Windsor soils. The soils of this unit are moderate to low in natural fertility. Available water capacity is low to moderate, but much of the rainfall is lost through runoff and little is retained for use by plants. The hazard of erosion is severe if these soils are left unprotected.

These soils are too steep to permit the use of machinery for liming, fertilizing, or mowing. These soils are best suited to wooded areas or wildlife habitat.

Grazing should not be permitted on the soils of this unit, in order to allow the maximum protective vegetative cover to develop.

CAPABILITY UNIT VIIs-1

This unit consists of deep, extremely stony, nearly level to moderately steep soils of the Broadalbin and Lansing series. These soils formed in glacial till on uplands. They are generally well drained, but in places the Broadalbin soils are moderately well drained. The Broadalbin soils have a fragipan 18 to 36 inches below the surface that restricts water movement and rooting. Large stones more than 10 inches in diameter are 2½ to 5 feet apart on the surface.

The Broadalbin soils are very low to medium in content of lime and low to moderate in natural fertility. The Lansing soils are medium in content of lime and moderate to high in natural fertility. Available water capacity of Broadalbin soils is moderate and that of Lansing soils high.

These soils are too stony for crops, hay, or renovated pasture. Open areas provide some native pasture. Where possible, topdressing with lime and fertilizer increases forage production.

CAPABILITY UNIT VIIs-2

This unit consists of deep, excessively drained soils of the Hinckley and Windsor series. These soils formed in gravelly and sandy glacial deposits. The Hinckley soils are moderately sloping and moderately steep, and the Windsor soils are moderately steep. These soils are on glacial outwash terraces, kames, and deltas.

The Hinckley soils of this unit are very low or low in content of lime, and the Windsor soils are very low in content of lime. These soils are low in natural fertility. Available water capacity is very low or low in the Hinckley soils and very low to moderate in the Windsor soils. Runoff is rapid, and very little rainfall is retained for use by plants. These soils are droughty. If they are left unprotected, erosion is a hazard, and the Windsor soils especially are subject to soil blowing.

These soils are best suited to selected woodland species. They are not suited to crops, and production of pasture forage is low. Response to lime and fertilizer is low because of droughtiness, slope, and low natural fertility.

Grazing should not be permitted on the soils of this unit. All natural vegetative ground cover produced should be left in place and maintained for erosion control.

CAPABILITY UNIT VIIs-3

This unit consists of shallow, very rocky soils of the Farmington series that are nearly level to moderately steep, and of a complex of the Farmington series and Rock land that are steep. The Farmington soils in this unit are well drained and medium textured and have limestone bedrock 10 to 20 inches below the surface.

The Farmington soils of this unit are medium in content of lime and moderate to low in natural fertility. Available water capacity is low. Numerous rock outcrops and very shallow areas severely limit the use of these soils for farming.

The soils of this unit are not suited to crops, and only limited forage production is possible, even on the more level areas, because of shallowness and rock outcrops. Machinery cannot be used safely on these soils. Some early grazing can be obtained in areas where open grass cover is available.

CAPABILITY UNIT VIIs-4

This unit consists of deep, very stony, somewhat poorly drained to very poorly drained soils of the Appleton, Manheim, Ilion, and Sun series. These soils are nearly level and gently sloping and are on uplands. Large stones more than 10 inches in diameter are from 5 to 30 feet apart on the surface.

The soils of this unit are medium and high in content of lime. All the soils of this unit except Sun are moderate to high in natural fertility. The Sun soils are moderate to low in natural fertility. Available water capacity of the root zone is moderate to high in the Appleton and Manheim and low in the Ilion and Sun soils. Normally more than enough water is available for plant growth. The Ilion and Sun soils have a water table at or near the surface for long periods.

In their natural condition, the soils of this unit are not suited to crops. Stoniness severely limits use for farming. The water table of Ilion and Sun soils also limits these soils for crops. Cleared areas with stands of forage can be topdressed with a complete fertilizer that improves the soils for summer forage.

CAPABILITY UNIT VIIIw-1

Fresh water marsh, a miscellaneous land type, makes up this unit. It consists of marshy spots around ponded areas in the uplands. These areas are periodically flooded, and they support a growth of grasses, cattails, rushes, and other herbaceous plants.

Fresh water marsh is not suitable for commercial production of plants, but it is suited for some types of recreation and wildlife habitat.

Estimated Yields [3]

Table 1 lists, for each soil in the county, the estimated yields per acre of corn, oats, forage mixtures, and grass meadow, under two levels of management. No yields are given for soils that are generally not cropped.

The figures in columns A represent yields to be expected under average management. Under the A level management, soil, water, and crop management practices are less intensive than those suggested in "Cornell Recommends." Lime applications maintain a reaction of only pH 6.0 or less. Fertilizer is seldom applied to sod crops and does not meet crop needs. Only spot drainage is used and summer rainfall is often wasted because erosion-control practices are lacking. Rotations are haphazard and the best adapted crop varieties are only occasionally used. Field operations are often not performed on time. Control of weeds, insects, and plant diseases is not consistently carried out. Estimates shown in columns A are a little above the average yields obtained by farmers in the county in the early 1960's.

The figures in columns B represent yields that can be expected by farmers using improved management practices. These include using suitable crop rotations; applying lime and fertilizer in kinds and amounts indicated by soil tests; providing adequate drainage where needed; using contour farming, stripcropping, sodded waterways, or other measures to conserve soil and water; controlling weeds and insects; and tilling at the right time and in the right way. Yields of crops under this high level of management are now increasing at the rate of about 2 percent each year and can be expected to increase further as new varieties of crops are developed and management is improved.

The annually revised editions of "Cornell Recommends for Field Crops," can be used as a guide for the kinds of management needed to obtain the yields shown in columns B.

Use of the Soils for Woodland [4]

About 23 percent, or 87,550 acres (*7*),[5] of the survey area is wooded. The average wooded area on farms in the survey area is approximately 24 acres. The forests are predominantly northern hardwoods. Small patches of hemlock grow in ravines. White pine and northern white cedar grow in the swamps and on the calcareous soils, many of which are shallow. Harvest of timber proceeds actively, and wood-using industries in and near the survey area contribute substantially to its economy.

Woodland suitability groups

The soils in the southern part of Herkimer County have been placed in 28 woodland suitability groups. The woodland groups and the suitability of the soils in these groups for woodland are described in table 2.

---

[3] Prepared by E. L. McPherron, agronomist, and Carl R. Frost, district conservationist, Soil Conservation Service, and J. Joseph Brown and Richard D. Morse, cooperative extension agents.

[4] By M. Peters, woodland conservationist, Soil Conservation Service.

[5] Italic numbers in parentheses refer to Literature Cited, p. 168.

TABLE 1.—*Estimated average yields per acre of specified field crops under two levels of management*

[Yields in columns A are those to be expected under ordinary management; those in columns B can be expected under improved management. Absence of a yield figure indicates that the crop is not suited to the soil or is not commonly grown]

Soil	Corn For silage A	Corn For silage B	Corn For grain A	Corn For grain B	Oats A	Oats B	Alfalfa A	Alfalfa B	Alfalfa-trefoil-grass A	Alfalfa-trefoil-grass B	Trefoil-grass A	Trefoil-grass B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Allis silt loam	----	----	----	----	----	----	----	----	----	----	----	----
Alluvial land	----	----	----	----	----	----	----	----	----	----	----	----
Appleton silt loam, 0 to 3 percent slopes	10	22	50	110	40	85	2.5	4.0	2.5	3.5	2.0	3.0
Appleton silt loam, 3 to 8 percent slopes	10	22	50	110	40	85	2.5	4.0	2.5	3.5	2.0	3.0
Appleton and Manheim very stony silt loams, 0 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Bombay very fine sandy loam, 3 to 8 percent slopes	16	22	80	110	60	85	3.0	4.5	2.5	4.0	2.0	3.0
Bombay very fine sandy loam, 8 to 15 percent slopes	14	20	70	100	50	75	3.0	4.5	2.5	4.0	2.0	3.0
Broadalbin loam, 2 to 8 percent slopes	10	18	50	80	60	75	3.0	4.5	2.5	4.0	2.0	3.5
Broadalbin loam, 8 to 15 percent slopes	9	17	45	75	55	70	3.0	4.0	2.5	3.5	2.0	3.0
Broadalbin loam, 15 to 25 percent slopes	8	15	40	60	40	60	2.5	4.0	2.0	3.5	2.0	3.0
Broadalbin and Lansing extremely stony soils, 0 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Burdett silt loam, 0 to 3 percent slopes	8	16	40	80	40	75	2.5	4.0	2.5	4.0	2.0	3.0
Burdett silt loam, 3 to 8 percent slopes	8	16	40	80	40	75	2.5	4.0	2.5	4.0	2.0	3.0
Burdett silt loam, 8 to 15 percent slopes	7	15	35	75	50	75	2.5	3.5	2.5	3.5	2.0	3.0
Canton stony very fine sandy loam, 2 to 8 percent slopes	16	24	80	120	70	90	3.5	5.0	3.0	4.5	2.5	4.0
Canton stony very fine sandy loam, 8 to 15 percent slopes	14	22	70	110	60	85	3.0	4.5	2.5	4.0	2.0	3.5
Carlisle muck	----	22	----	110	----	----	----	----	----	----	1.0	3.5
Cohoctah mucky very fine sandy loam	----	----	----	----	----	----	----	----	----	----	----	----
Conesus silt loam, 2 to 8 percent slopes	14	24	70	120	50	90	3.0	5.5	2.5	5.0	2.5	4.5
Cut and fill land	----	----	----	----	----	----	----	----	----	----	----	----
Farmington silt loam, 0 to 8 percent slopes	12	16	60	80	35	50	2.5	3.5	2.0	3.0	1.5	2.5
Farmington very rocky silt loam, 0 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	1.0	2.0
Farmington-Rock land complex, steep	----	----	----	----	----	----	----	----	----	----	----	----
Fredon fine sandy loam	12	22	60	110	50	80	2.0	3.5	2.0	3.0	2.0	3.0
Fresh water marsh	----	----	----	----	----	----	----	----	----	----	----	----
Halsey soils	----	17	----	85	----	70	----	3.0	1.0	3.0	1.0	3.0
Hamlin fine sandy loam	16	26	80	130	50	100	4.0	6.0	4.0	5.5	3.0	4.0
Hamlin silt loam	16	26	80	130	50	100	4.0	6.0	4.0	5.5	3.0	4.0
Hartland-Agawam complex, 3 to 8 percent slopes	16	26	80	130	50	100	4.0	6.0	4.0	5.5	3.0	4.0
Hartland-Agawam complex, 8 to 15 percent slopes	14	24	70	120	50	95	3.5	5.5	3.5	5.0	3.0	4.0
Hartland-Agawam complex, 15 to 25 percent slopes	10	20	50	100	45	85	3.0	5.0	3.0	4.5	2.5	3.5
Herkimer gravelly silt loam, 0 to 3 percent slopes	16	24	80	120	45	85	4.0	5.0	3.5	4.5	3.5	4.5
Herkimer gravelly silt loam, 3 to 8 percent slopes	16	24	80	120	45	85	4.0	5.0	3.5	4.5	3.5	4.5
Herkimer gravelly silt loam, moderately well drained, 0 to 4 percent slopes	16	24	80	120	45	85	4.0	5.0	3.5	4.5	3.5	4.5
Hilton silt loam, 3 to 8 percent slopes	16	26	80	130	50	100	4.0	5.0	3.5	4.5	3.5	4.5
Hilton silt loam, 8 to 15 percent slopes	14	24	70	120	50	95	4.0	5.0	3.5	4.5	3.5	4.5
Hinckley gravelly loamy sand, 0 to 3 percent slopes	8	12	40	60	30	50	1.0	2.5	1.0	2.0	----	----
Hinckley gravelly loamy sand, 3 to 8 percent slopes	8	12	40	60	30	50	1.0	2.5	1.0	2.0	----	----
Hinckley gravelly loamy sand, 8 to 15 percent slopes	8	12	40	60	30	50	1.0	2.5	1.0	2.0	----	----
Hinckley and Windsor soils, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Hinckley and Windsor soils, 25 to 70 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Honeoye silt loam, 3 to 8 percent slopes	20	26	100	130	80	100	4.0	6.0	3.5	5.0	3.0	4.0
Honeoye silt loam, 8 to 15 percent slopes	18	24	90	120	80	100	4.0	6.0	3.5	5.0	3.0	4.0
Honeoye silt loam, 15 to 25 percent slopes	16	21	80	105	70	90	3.0	5.0	3.0	4.0	2.0	3.0
Honeoye and Lansing silt loams, 25 to 35 percent slopes	----	----	----	----	----	----	----	----	----	----	1.0	2.0
Honeoye and Mohawk very stony silt loams, 0 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Hornell silt loam, 0 to 3 percent slopes	12	16	60	80	40	70	2.5	3.5	2.5	3.5	2.0	3.0
Hornell silt loam, 3 to 8 percent slopes	12	16	60	80	50	65	2.5	3.5	2.5	3.5	2.0	3.0
Hornell silt loam, 8 to 15 percent slopes	10	14	50	70	50	65	2.5	3.5	2.5	3.5	2.0	3.0
Howard gravelly fine sandy loam, 0 to 3 percent slopes	20	26	100	130	80	100	3.5	5.0	3.0	4.0	3.0	4.0
Howard gravelly fine sandy loam, 3 to 8 percent slopes	20	26	100	130	80	100	3.5	5.0	3.0	4.0	3.0	4.0
Howard gravelly fine sandy loam, 8 to 15 percent slopes	18	24	90	120	75	95	3.5	5.0	3.0	4.0	3.0	4.0
Howard gravelly silt loam, 0 to 3 percent slopes	20	26	100	130	80	100	3.5	5.0	3.0	4.0	3.0	4.0

TABLE 1.—*Estimated average yields per acre of specified field crops under two levels of management*—Continued

Soil	Corn				Oats		Alfalfa		Alfalfa-trefoil-grass		Trefoil-grass	
	For silage		For grain									
	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Howard gravelly silt loam, 3 to 8 percent slopes	20	26	100	130	80	100	3.5	5.0	3.0	4.0	3.0	4.0
Howard gravelly silt loam, 8 to 15 percent slopes	18	24	90	120	75	95	3.5	5.0	3.0	4.0	3.0	4.0
Howard and Palmyra soils, 15 to 25 percent slopes	16	20	80	100	65	85	2.5	4.0	2.5	3.5	2.0	3.0
Hudson silt loam, loamy substratum, 2 to 8 percent slopes	12	20	60	100	50	70	3.5	5.0	3.0	4.0	3.0	4.0
Hudson silt loam, loamy substratum, 8 to 15 percent slopes	12	18	60	90	50	70	3.5	5.0	3.0	4.0	3.0	4.0
Hudson silt loam, loamy substratum, 15 to 30 percent slopes	------	------	------	------	----	----	2.0	3.0	2.0	3.0	2.0	3.0
Ilion silt loam	------	12	------	60	----	50	------	3.0	1.0	3.0	1.0	3.0
Ilion and Sun very stony silt loams	------	------	------	------	----	----	------	------	------	------	------	------
Lairdsville silt loam, loamy subsoil variant, 3 to 8 percent slopes	13	19	65	95	65	85	2.5	4.5	2.5	4.5	2.0	3.0
Lairdsville silt loam, loamy subsoil variant, 8 to 15 percent slopes	12	17	50	85	60	80	2.5	4.5	2.5	4.5	2.0	3.5
Lairdsville silt loam, loamy subsoil variant, 15 to 25 percent slopes	------	------	------	------	----	----	2.0	4.0	2.0	4.0	1.5	3.0
Lamson mucky silt loam	------	18	------	90	----	50	------	------	2.0	3.5	1.5	3.0
Lansing silt loam, 8 to 15 percent slopes	16	22	80	110	60	95	3.0	5.5	3.0	5.0	2.5	4.5
Lansing silt loam, 15 to 25 percent slopes	15	20	75	100	50	80	2.5	5.0	2.5	4.5	2.5	4.0
Lima silt loam, 0 to 3 percent slopes	18	24	90	120	75	90	3.5	5.0	3.0	4.5	2.5	4.0
Lima silt loam, 3 to 8 percent slopes	18	24	90	120	75	90	3.5	5.0	3.0	4.5	2.5	4.0
Lima silt loam, 8 to 15 percent slopes	16	22	80	110	75	85	3.0	4.5	3.0	4.0	2.5	4.0
Lockport silt loam, loamy subsoil variant, 0 to 4 percent slopes	8	18	40	90	30	80	------	4.5	1.0	3.5	1.0	3.0
Lyons mucky silt loam	------	18	------	90	----	80	------	3.5	1.0	3.5	1.0	3.0
Manheim silt loam, 0 to 3 percent slopes	15	20	75	100	----	70	------	------	2.0	3.5	2.0	3.0
Manheim silt loam, 3 to 8 percent slopes	15	20	75	100	50	70	------	3.5	2.0	3.5	2.0	3.0
Manheim silt loam, 8 to 15 percent slopes	14	18	70	90	50	70	------	3.5	1.5	3.0	1.5	2.5
Manlius shaly silt loam, 3 to 8 percent slopes	12	18	60	90	60	80	2.5	4.0	2.5	4.0	2.0	3.0
Manlius shaly silt loam, 8 to 15 percent slopes	10	16	50	80	55	70	2.5	4.0	2.5	3.5	2.0	3.0
Manlius shaly silt loam, 15 to 25 percent slopes	------	------	------	------	----	----	2.0	3.5	2.0	3.0	1.5	2.0
Massena very fine sandy loam, 0 to 8 percent slopes	10	20	50	100	40	80	------	4.0	2.0	4.0	2.0	3.5
Mohawk silt loam, shale substratum, 3 to 8 percent slopes	14	24	70	120	65	95	3.0	5.5	3.0	5.5	2.5	4.5
Mohawk silt loam, shale substratum, 8 to 15 percent slopes	12	22	60	110	60	90	3.0	5.0	3.0	5.0	2.5	4.5
Mohawk silt loam, shale substratum, 15 to 25 percent slopes	10	20	50	100	50	80	2.5	4.5	2.5	4.5	2.5	4.0
Mosherville very fine sandy loam, 2 to 8 percent slopes	10	20	50	100	40	80	------	4.0	2.0	4.0	2.0	3.5
Nassau silt loam, 3 to 8 percent slopes	------	12	------	60	40	70	1.0	3.0	1.0	2.0	1.0	2.0
Nassau silt loam, 8 to 15 percent slopes	------	------	------	------	40	65	1.0	3.0	1.0	2.0	1.0	2.0
Nassau silt loam, 15 to 25 percent slopes	------	------	------	------	35	60	1.0	2.5	1.0	2.0	1.0	2.0
Ontario silt loam, 3 to 8 percent slopes	12	26	60	130	55	110	3.5	6.0	2.5	5.0	2.0	3.5
Ontario silt loam, 8 to 15 percent slopes	12	24	60	120	50	100	3.5	5.5	2.5	3.0	2.0	3.0
Ontario silt loam, 15 to 25 percent slopes	10	20	50	100	40	80	3.0	4.5	2.0	3.0	2.0	3.0
Palatine silt loam, 2 to 8 percent slopes	16	20	80	100	50	80	3.0	5.0	2.0	4.5	2.0	3.0
Palatine silt loam, 8 to 15 percent slopes	14	18	70	90	50	80	2.5	4.0	2.0	3.5	1.5	3.0
Palatine silt loam, 15 to 25 percent slopes	10	14	50	70	40	60	2.0	3.5	1.0	3.0	1.0	3.5
Palms muck	------	------	------	------	----	----	------	------	------	------	------	------
Palmyra gravelly silt loam, 0 to 3 percent slopes	18	24	90	120	80	100	3.5	5.5	3.0	4.5	3.0	4.0
Palmyra gravelly silt loam, 3 to 8 percent slopes	18	24	90	120	80	100	3.5	5.5	3.0	4.5	3.0	4.0
Palmyra gravelly silt loam, 8 to 15 percent slopes	16	22	80	110	75	95	3.0	5.0	3.0	4.5	3.0	4.0
Palmyra and Howard soils, rolling	------	------	------	------	40	70	2.5	3.5	2.5	3.5	2.0	3.0
Palmyra and Howard soils, 25 to 70 percent slopes	------	------	------	------	----	----	------	------	------	------	------	------
Phelps gravelly fine sandy loam, 0 to 4 percent slopes	20	24	100	120	60	100	3.0	5.0	3.5	4.5	3.0	4.5
Raynham silt loam, 0 to 4 percent slopes	10	18	50	90	----	75	------	------	------	3.5	------	4.0
Rhinebeck silt loam, loamy substratum, 0 to 3 percent slopes	8	18	40	90	35	80	------	3.0	2.0	3.5	2.0	3.5
Rhinebeck silt loam, loamy substratum, 3 to 8 percent slopes	8	18	40	90	40	80	------	3.0	2.0	3.5	2.0	3.5
Rough broken land	------	------	------	------	----	----	------	------	------	------	------	------
Sandstone rock land	------	------	------	------	----	----	------	------	------	------	------	------
Shaly rock land, very steep	------	------	------	------	----	----	------	------	------	------	------	------

TABLE 1.—*Estimated average yields per acre of specified field crops under two levels of management*—Continued

Soil	Corn				Oats		Alfalfa		Alfalfa-trefoil-grass		Trefoil-grass	
	For silage		For grain									
	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Sun mucky silt loam	------	12	------	60	----	40	------	3.5	------	2.0	------	1.5
Teel fine sandy loam	16	26	80	130	40	100	3.0	5.0	2.5	4.0	2.0	4.0
Teel silt loam	16	26	80	130	40	100	3.0	5.0	2.5	4.0	2.0	4.0
Wassaic silt loam, 0 to 3 percent slopes	16	24	80	120	40	75	3.0	4.5	3.0	4.5	2.0	3.0
Wassaic silt loam, 3 to 8 percent slopes	16	24	80	120	40	75	3.0	4.5	3.0	4.5	2.0	3.0
Wassaic silt loam, 8 to 15 percent slopes	14	22	70	110	35	70	3.0	4.5	3.0	4.5	2.0	3.0
Wassaic silt loam, 15 to 25 percent slopes	12	18	60	90	35	65	3.0	4.0	3.0	4.0	1.5	2.5
Wayland silt loam	------	18	------	90	20	75	------	4.0	1.0	4.0	1.0	3.5
Williamson silt loam, 0 to 3 percent slopes	15	21	75	105	40	80	3.0	4.5	3.0	4.0	2.0	3.0
Williamson silt loam, 3 to 8 percent slopes	15	21	75	105	40	80	3.0	4.5	3.0	4.0	2.0	3.0
Windsor loamy fine sand, 0 to 3 percent slopes	10	14	50	70	40	60	2.0	3.5	2.0	2.5	1.0	2.0
Windsor loamy fine sand, 3 to 8 percent slopes	10	14	50	70	40	60	2.0	3.5	2.0	2.5	1.0	2.0
Windsor loamy fine sand, 8 to 15 percent slopes	8	12	40	60	30	50	1.5	2.5	1.5	2.0	1.0	1.5

Each group is made up of soils that are similar in potential productivity, are suited to similar kinds of wood crops, and require similar management. The names of the soils in each group can be readily learned by referring to the "Guide to Mapping Units." Each mapping unit, except for the land types Alluvial land; Cut and fill land; Fresh water marsh; Rough broken land; Sandstone rock land; and Shaly rock land, very steep, has been placed in a woodland suitability group. The miscellaneous land types are generally not suitable for commercial production of trees.

The slope ranges used in determining woodland suitability groupings were 0 to 8 percent, 8 to 15 percent, 15 to 35 percent, and 35 percent or more. In this survey the range in percentage of slope for some of the mapping units differs from these. Appropriate interpolations were made in such instances.

In addition to a brief description of the soils in the group, table 2 gives an indicator species for each group and the site index for that species. The site index is the height that the tree will attain at 50 years of age. Under management problems for each group, ratings are given for erosion hazard, equipment restriction, seedling mortality, plant competition, and windthrow hazard. The ratings are slight, moderate, or severe according to the degree of the limitation. Also given in the table is species suitability for the soils of each group, both for planting and to favor in natural stands.

Each woodland suitability group is identified by a three-part symbol, such as 2o1, 3w3, or 4d1.

The first element of the group symbol indicates the potential productivity based on the site index of the indicator tree species. In this survey area, it is expressed by Arabic numerals ranging from 2 through 5. Soils in Class 2 have the highest potential productivity.

The second element in the symbol indicates the woodland suitability group subclass. It expresses the dominant soil feature that causes management problems. Some soils within groups may have more than one kind of subclass characteristic. Priority in placing each kind of soil into a subclass is in the order that the subclass characteristics are listed below:

Subclass x (stonines or rockiness).—Soils that have restrictions or limitations for woodland use or management due to stones or rocks.

Subclass w (excessive wetness).—Soils in which excessive water, either seasonally or the year round, causes significant limitations for woodland use or management.

Subclass d (restricted rooting depth).—Soils that have restrictions or limitations for woodland use or management because of restricted rooting depths. Soils that are shallow to hard bedrock are examples.

Subclass s (sandy soils).—Soils that have restrictions or limitations for woodland use or management due to the amount of coarse-textured material in the profile.

Subclass r (relief or slope).—Soils that have restrictions or limitations for woodland use or management because of slope.

Subclass o (slight or no limitations).—Soils that have no significant restrictions or limitations for woodland use or management.

The third element in the symbol indicates differences in the degree of hazards or limitations or the general suitability of the soils for certain kinds of trees. The management problems considered are erosion hazard, equipment limitations, seedling mortality, plant competition, and windthrow hazard. The ratings are slight, moderate, or severe according to the degree of the limitation.

Erosion hazard is rated according to the potential of soil erosion that can occur following cutting operations where the soil is exposed along roads, skid trails, fire lanes, and log decking areas.

Equipment restrictions refers to the trafficability of the soils in the group. Ratings are recorded indicating the degree to which soils restrict or prohibit the use of equipment commonly used in tree harvesting.

Seedling mortality refers to the expected degree of failure for natural seedlings or planting stock as influenced by kinds of soil, degree of erosion, or other site factors. The rating is *slight* if the expected mortality is less than 25 percent, *moderate* if expected mortality is between 25 to 50 percent, and *severe* if over 50 percent.

Plant competition refers to the invasion or growth of undesirable species when openings are made in the tree canopy. The rating is *slight* when competition will not delay natural or artificial regeneration of desirable species; *moderate* when competition will delay, but not prevent, natural or artificial regeneration; and *severe* when competition will prevent adequate natural or artificial regeneration without intensive site preparation and maintenance treatments, such as weeding.

Windthrow hazard is an evaluation of the soil characteristics that control root development and affect the resistance of the trees to wind. The rating is *slight* if windthrow is not a problem. It is *moderate* if root development is adequate for stability, except during periods of soil wetness or during periods of strong wind velocities. It is *severe* if many trees are expected to be blown over because their roots do not provide enough stability.

Species to favor in existing stands is a listing of the species commonly found that would be managed for woodland crops. This listing is not intended to be in order of preference.

Species for planting is a listing of species suitable for open field and woodland interplanting.

Wildlife [6]

Wildlife is an important natural resource in Herkimer County. In the northern part of the county, which is in the Adirondack Mountain region, are populations of white-tailed deer, black bear, ruffed grouse, gray squirrels, and snowshoe hare. In the southern part of the county are ring-necked pheasants and cottontail rabbits in addition to deer, grouse, and squirrels. Songbirds are enjoyed by residents and vacationers throughout the county.

The kind and amount of wildlife in a given area are closely related to land use; to the resulting kinds, amounts, and patterns of vegetation; and to the supply and distribution of water. These, in turn, generally depend on the type of soil.

The soils are rated in table 3 for eight elements of wildlife habitat: grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood plants, coniferous plants, wetland food and cover plants, shallow diked impoundments, and shallow excavated impoundments. Ratings are given for three classes of wildlife: openland, woodland, and wetland (*1*).

In the following paragraphs the rating system is explained, the habitat elements and classes of wildlife are discussed, and some ways to use the suitability ratings are listed.

The rating system is based on the relative suitability of the soil for the development and management of each habitat element. The class rating is based on an evaluation of the potential for developing all habitat elements that are essential to the particular class of wildlife.

A rating of 1 indicates that the soil is well suited with few limitations, 2 indicates that it is suited with moderate limitations, 3, poorly suited because of severe limitations, and 4, unsuited.

The ratings for elements of wildlife habitat can serve in selecting the best soils for creating, improving, or maintaining specific elements of wildlife habitat; determining the relative intensity of management required for individual habitat elements; and avoiding sites that would be difficult or not feasible to manage.

The ratings for classes of wildlife can be used as an aid in planning the broad use of land for wildlife refuge, nature-study areas, or other developments for wildlife; and determining areas that are suitable for acquisition for wildlife development.

Elements of wildlife habitat

Each soil is rated in the table according to its suitability for various kinds of plants or developments that make up the elements of wildlife habitat.

GRAIN AND SEED CROPS.—This group includes such seed-producing annuals as corn, sorghum, wheat, barley, oats, millet, buckwheat, and sunflower.

GRASSES AND LEGUMES.—In this group are domestic grasses and legumes that are established by planting. Among these are alfalfa, trefoil, clover, bluegrass, switchgrass, fescue, bromegrass, timothy, orchardgrass, and reed canarygrass.

WILD HERBACEOUS UPLAND PLANTS.—In this group are perennial grasses and weeds that generally are established naturally. They include bluestem, quackgrass, panicgrass, goldenrod, wild carrot, nightshade, and dandelion.

HARDWOOD PLANTS.—These are nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits, buds, catkins, twigs, or foliage that wildlife eat. They are generally established naturally, but may be planted. Among the hardwoods native to the survey area are oak, beech, cherry, maple, birch, poplar, apple, hawthorn, dogwood, viburnum, grape, and briers.

Also in this group are several varieties of fruiting shrubs that are raised commercially for planting. Among the shrubs that can be grown on soils rated well suited are autumn-olive, amur honeysuckle, tatarian honeysuckle, crabapple, multiflora rose, highbush cranberry, and silky dogwood. Highbush cranberry, silky dogwood, and other shrubs with similar site requirements also can be planted on soils that have a rating of suited. Hardwoods that are not available commercially can often be transplanted successfully.

CONIFEROUS PLANTS.—This group consists of cone-bearing evergreen trees and shrubs that are used by wildlife primarily as cover, though some provide browse and seeds. Among these are Norway spruce, white pine, white-cedar, and hemlock. It is important that living branches be maintained close to the ground so that food and cover are readily available to rabbits, pheasants, and other small animals. The lower branches die if trees form a dense canopy that shuts out the light, and planted conifers should be widely spaced to retard canopy closure.

WETLAND FOOD AND COVER PLANTS.—In this group are wild, herbaceous annual and perennial plants that grow on moist to wet sites. They include smartweed, wild millet, rushes, spikerush, sedges, rice cutgrass, mannagrass, and cattails.

[6] Prepared by ROBERT E. MYERS, wildlife biologist, Soil Conservation Service, Syracuse.

Table 2.—*Suitability of the*

Woodland suitability group	Potential productivity		Management problems
	Indicator species	Average site index	Erosion hazard
Group 2o1: These are deep and moderately deep, medium-textured and moderately coarse textured soils having low to high content of lime. They are mainly well drained or moderately well drained, but some areas of Palmyra and Howard soils range to somewhat excessively drained or excessively drained, and Teel soils range to somewhat poorly drained. The soils in this group are nearly level to moderately sloping or rolling. They formed in material ranging from glacial till on uplands to water-sorted glacial outwash, or lacustrine and alluvial sediment, on lower landscapes. Bombay: BoB, BoC. Conesus: CsB. Hamlin: He, Hf. Herkimer: HhA, HhB, HkB. Hilton: HlB, HlC. Honeoye: HoB, HoC. Hudson: HyB. Lansing: LnC. Lima: LoA, LoB, LoC. Mohawk: MoB, MoC. Ontario: OnB, OnC. Palatine: PaB, PaC. Palmyra: PlA, PlB, PlC. Palmyra and Howard: PmC. Phelps: PpB. Teel: Te, Ts. Wassaic: WaA, WaB, WaC. Williamson: WlA, WlB.	Sugar maple	65–75	Slight
Group 2o2: These are deep, well-drained to somewhat excessively drained, medium-textured and moderately coarse textured, gravelly soils having medium content of lime. They are nearly level to moderately sloping and formed in gravelly glacial outwash on terraces and kames. Howard: HuA, HuB, HuC, HvA, HvB, HvC.	Sugar maple	65–75	Slight
Group 2r1: These are deep and moderately deep, medium-textured soils having high or medium content of lime. They are mainly well drained, but some areas of Mohawk soils range to moderately well drained. The soils in this group are moderately steep or steep. They formed in glacial till on uplands. Honeoye: HoD. Honeoye and Lansing: HrE. Honeoye and Mohawk: HsD. Lansing: LnD. Mohawk: MoD. Ontario: OnD. Wassaic: WaD.	Sugar maple	65–75	Moderate
Group 2r2: These are deep, well-drained to excessively drained, medium-textured and moderately coarse textured, gravelly soils having medium or high content of lime. The soils in this group are moderately steep to very steep. They formed in gravelly glacial outwash on terraces and kames. Howard and Palmyra: HwD. Palmyra and Howard: PmF.	Sugar maple	65–75	Slight to moderate.
Group 2r3: This is a deep, moderately well drained, medium-textured soil with a moderately fine textured subsoil. It has medium to high content of lime. It is moderately sloping. It formed in clayey lacustrine sediment 40 inches or more thick over glacial till, glacial outwash, or bedrock. Hudson: HyC.	Sugar maple	65–75	Moderate
Group 2r4: This is a deep, moderately well drained, medium-textured soil with a moderately fine textured subsoil. It has medium to high content of lime. It is moderately steep. It formed in clayey lacustrine sediment 40 inches or more thick over glacial till, glacial outwash, or bedrock. Hudson: HyD.	Sugar maple	65–75	Severe
Group 2r5: This is a moderately deep, well-drained to somewhat excessively drained, medium-textured soil having high content of lime. It is moderately steep. It formed in thin glacial till, rich in dark calcareous shale, on uplands. Palatine: PaD.	Sugar maple	65–75	Moderate

See footnotes at end of table.

soils for woodland

Management problems—Continued					Suitable species—	
Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard	For planting	To favor in existing stands
		Hardwoods	Conifers			
Slight	Slight	Moderate	Severe	Slight	Norway spruce, [2] white spruce, larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, black cherry, basswood, ash, beech.
Slight	Slight	Moderate	Severe	Slight	Red pine, white spruce, larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, black cherry, basswood, ash, beech.
Moderate	Slight	Moderate	Severe	Slight	White pine,[2] white spruce, larches. Christmas trees:[1] Scotch pine varieties, white spruce.	Sugar maple, basswood, hemlock, black cherry, beech.
Moderate	Slight	Moderate	Severe	Slight	White pine,[2] white spruce, larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, basswood, ash, hemlock.
Slight	Slight	Moderate	Severe	Slight	White pine,[2] white spruce, larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, black cherry, basswood, ash.
Moderate	Slight	Moderate	Severe	Slight	White pine,[2] white spruce, larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, black cherry, basswood, ash.
Moderate	Slight	Moderate	Severe	Slight	White spruce, larches. Christmas trees: [1] Scotch pine varieties, white spru--	Sugar maple, basswood, black cherry, ash.

TABLE 2.—*Suitability of the*

Woodland suitability group	Potential productivity: Indicator species	Potential productivity: Average site index	Management problems: Erosion hazard
Group 3o1: These are deep and moderately deep, medium-textured soils having medium to very low content of lime. They are mainly well drained or moderately well drained, but some areas of Manlius soils range to excessively drained. The soils in this group are nearly level to moderately sloping. They formed in glacial till on uplands, and in silty and sandy deposits on lake plains or stream terraces. Broadalbin: BrB. Hartland-Agawam: HgB. Lairdsville: LaB. Manlius: MlB, MlC.	Sugar maple	55–65	Slight
Group 3r1: These are deep and moderately deep, medium-textured soils having medium to very low content of lime. They are mainly well drained or moderately well drained, but some areas of Manlius soils range to excessively drained. The soils of this group are moderately sloping to moderately steep. They formed in glacial till on uplands, and in silty and sandy deposits on lake plains and stream terraces. Broadalbin: BrC. Hartland-Agawam: HgC. Lairdsville: LaC. Manlius: MlD.	Sugar maple	55–65	Moderate
Group 3r2: These are deep and moderately deep, well-drained or moderately well drained, medium-textured soils having medium to very low content of lime. They are moderately steep and formed in glacial till on uplands and in silty and sandy deposits on lake plains. Broadalbin: BrD. Hartland-Agawam: HgD. Lairdsville: LaD.	Sugar maple	55–65	Severe
Group 3w1: These are deep, somewhat poorly drained, medium-textured soils having medium to high content of lime. They are nearly level to moderately sloping. All but the Rhinebeck soils formed in glacial till on uplands. The Rhinebeck soils formed in clayey lacustrine sediment 40 inches or more thick over glacial till, glacial outwash, or bedrock. Appleton: ApA, ApB. Appleton and Manheim: AtB. Burdett: BuA, BuB, BuC. Manheim: McA, McB, McC. Rhinebeck: RbA, RbB.	Red maple Sugar maple	70–80 55–65	Slight
Group 3w2: These are deep, somewhat poorly to poorly drained, medium-textured and moderately coarse textured soils having medium to high content of lime. They are nearly level to gently sloping and formed in glacial till on uplands and gravelly outwash on terraces. Fredon: Fr. Massena: MnB.	Red maple	70–80	Slight
Group 3w3: These are deep and moderately deep, medium-textured soils having very low to high content of lime. They are mainly somewhat poorly drained, but Hornell soils range to moderately well drained. The soils in this group are nearly level to gently sloping. They formed in glacial till on uplands. Hornell: HtA, HtB. Lockport: LpB. Mosherville: MsB.	Sugar maple	55–65	Slight
Group 3w4: This is a moderately deep, somewhat poorly drained to moderately well drained, medium-textured soil having a fine-textured subsoil. It has very low content of lime. It is moderately sloping and formed in thin shaly till on uplands. Hornell: HtC.	Sugar maple	55–65	Moderate
Group 3x1: These are deep, well-drained to moderately well drained, medium-textured soils having very low to medium content of lime. They are extremely stony. The soils in this group are nearly level to moderately steep. They formed in glacial till on uplands. Broadalbin and Lansing: BsD.	Sugar maple	55–65	Moderate
Group 4o1: These are deep, well-drained, medium-textured soils that have a coarse-textured substratum and low content of lime. They are gently to moderately sloping and formed in glacial till on uplands. Canton: CaB, CaC.	White pine	60–70	Slight

See footnotes at end of table.

soils for woodland—Continued

Management problems—Continued					Suitable species—	
Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard	For planting	To favor in existing stands
		Hardwoods	Conifers			
Slight	Slight	Slight	Moderate	Slight	White pine,[2] Norway spruce,[2] white spruce, larches. Christmas trees:[1] Scotch pine varieites, white spruce.	Sugar maple, black cherry, white pine, yellow birch, ash, basswood.
Slight	Slight	Slight	Moderate	Slight	White pine,[2] Norway spruce,[2] white spruce, larches. Christmas trees:[1] Scotch pine varieties, white spruce.	Sugar maple, black cherry, white pine, yellow birch ash, basswood.
Moderate	Slight	Slight	Moderate	Slight	White pine,[2] Norway spruce,[2] white spruce, larches. Christmas trees:[1] Scotch pine varieties, white spruce.	Sugar maple, black cherry, white pine, yellow birch, ash, basswood.
Moderate	Moderate	Moderate	Severe	Moderate	White spruce. Christmas trees: [1]Scotch pine varieties, white spruce.	Red maple, sugar maple, bass wood, ash, hemlock.
Moderate	Moderate	Moderate	Severe	Moderate	White spruce. Christmas trees: [1]Scotch pine varieties, white spruce.	Red maple, ash, elm.
Moderate	Moderate	Moderate	Severe	Moderate	White spruce. Christmas trees: [1]Scotch pine varieties, white spruce.	Sugar maple, red mape, basswood, ash, hemlock.
Moderate	Moderate	Moderate	Severe	Moderate	White spruce. Christmas trees: [1]Scotch pine varieties, white spruce.	Sugar maple, red maple, ash, basswood, hemlock.
Moderate	Slight	Slight	Moderate	Slight	Red pine, white spruce, larches	Sugar maple, black cherry ash basswood, beech.
Slight	Slight	Slight	Moderate	Slight	White pine,[2] red pine, larches, white spruce.	White pine, red pine, red oak, red spruce, sugar maple, hemlock.

TABLE 2.—*Suitability of the*

Woodland suitability group	Potential productivity		Management problems
	Indicator species	Average site index	Erosion hazard
Group 4dl: These are shallow, somewhat excessively drained, medium-textured soils having very low content of lime. They are gently to moderately sloping and formed in thin, shaly glacial till on uplands. Nassau: NaB, NaC.	Sugar maple	55–60	Slight
Group 4wl: These are deep, mainly very poorly drained to poorly drained soils that have medium to high content of lime. All but Palms muck have medium-textured mineral surface layers having a high content of organic matter. They are nearly level or depressional and formed in glacial till on uplands, silty and sandy lacustrine deposits on lake plains, silty deposits on flood plains, and thin organic deposits in depressional areas. Ilion: In. Ilion and Sun: Is. Lamson: Lk. Lyons: Ly. Palms: Pk. Raynham: RaB. Sun: Sm. Wayland: Wd.	Red maple	60–70	Slight
Group 4x1: This is a shallow, somewhat excessively drained, medium-textured soil having very low content of lime. It is moderately steep and formed in thin, shaly glacial till on uplands. Nassau: NaD.	Sugar maple	55–60	Moderate
Group 5s1: These are deep, excessively drained, coarse-textured soils having low to very low content of lime. They are nearly level to moderately sloping and formed in water-sorted deposits of sand, or sand and gravel, on glacial outwash terraces, deltas, or kames. Hinckley: HmA, HmB, HmC. Windsor: WnA, WnB, WnC.	Red pine Sugar maple	58 45–50	Slight
Group 5s2: These are deep, excessively drained, coarse-textured soils having low to very low content of lime. They are moderately steep and formed in water-sorted sand, or sand and gravel, on glacial outwash terraces, deltas, or kames. Hinckley and Windsor: HnD.	Sugar maple Red pine	45–50 58	Slight
Group 5s3: These are deep, excessively drained, coarse-textured soils having low to very low content of lime. They are steep to very steep and formed in water-sorted sand, or sand and gravel, on glacial outwash terraces, deltas, or kames. Hinckley and Windsor: HnF.	Sugar maple Red pine	45–50 58	Moderate
Group 5d1: This is a shallow, well-drained, medium-textured soil having medium content of lime. It is nearly level to gently sloping and formed in thin glacial till on uplands. Farmington: FaC.	Sugar maple	45–50	Slight
Group 5w1: This is a moderately deep, poorly drained to somewhat poorly drained, medium-textured soil having a moderately fine to fine-textured subsoil and low to very low content of lime. It is nearly level and formed in thin shaly glacial till on uplands. Allis: Aa.	Red maple	45–55	Slight
Group 5w2: These are deep, poorly drained and very poorly drained soils that have medium to high content of lime. All but Carlisle muck have medium-textured to moderately coarse textured surface layers with a high organic-matter content. They are nearly level or depressional. They formed in gravelly outwash on terraces, silty and sandy alluvium on flood plains, and deep organic deposits in depressions. Carlisle: Cm. Cohoctah: Co. Halsey: Ha.	Red maple	45–55	Slight
Group 5x1: This is a shallow, well-drained, medium-textured soil having medium content of lime. Limestone bedrock is exposed over approximately 10 to 25 percent of the acreage of this soil. It is nearly level to moderately steep and formed in thin glacial till on uplands. Farmington: FcD.	Sugar maple	45–50	Slight
Group 5x2: This is a shallow, well-drained, medium-textured soil intermingled with bedrock, generally limestone, exposed over 25 to 80 percent of its acreage. This soil is steep and formed in thin till on uplands. Farmington-Rock land: FkE.	Sugar maple	45–50	Moderate

[1] The New York State Department of Environmental Conservation can provide information on Scotch pine varieties.

soils for woodland—Continued

Management problems—Continued					Suitable species—	
Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard	For planting	To favor in existing stands
		Hardwoods	Conifers			
Slight	Moderate	Slight	Moderate	Moderate	White spruce. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, white pine, ash, basswood, beech.
Severe	Severe	Severe	Severe	Moderate	Unplantable	Red maple, hemlock, elm.
Moderate	Moderate	Slight	Moderate	Moderate	White spruce, larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, basswood, ash.
Slight	Moderately	Slight	Slight	Slight	Red pine, larches, white spruce. Christmas trees:[1] Scotch pine varieties, white spruce.	Sugar maple, black cherry, ash, basswood, beech, birch.
Moderate	Moderate	Slight	Slight	Slight	Red pine, larches, white spruce. Christmas trees:[1] Scotch pine varities, white spruce.	Sugar maple, black cherry, ash, basswood, beech, birch, red pine.
Severe	Moderate	Slight	Slight	Slight	Red pine, larches, white spruce. Christmas trees:[1] Scotch pine varieties, white spruce.	Sugar maple, red pine, black cherry, ash, basswood, beech, birch.
Slight	Severe	Slight	Slight	Moderate	White spruce. Scotch pine varieties, white spruce.	Sugar maple, ash, basswood beech, hickories.
Severe	Severe	Moderate	Moderate	Severe	Unplantable	Red maple, elm, hemlock.
Severe	Severe	Severe	Severe	Severe	Unplantable	Red maple, white cedar, black ash, hemlock.
Moderate	Severe	Slight	Slight	Moderate	White spruce larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, ash, basswood, beech, hickories.
Severe	Severe	Moderate	Moderate	Severe	White spruce, larches. Christmas trees: [1] Scotch pine varieties, white spruce.	Sugar maple, ash, hickories, basswood, beech.

[2] In some places high local incidence of weevil or blister rust infestation may dictate use of another species. The New York State Department of Environmental Conservation can provide information.

TABLE 3.—*Suitability of the soils*

[A rating of 1 indicates that the soil is well suited; 2, the soil is suited; 3, poorly suited; and 4, unsuited. Not rated are

Soil	Elements of wildlife habitat	
	Grain and seed crops	Grasses and legumes
Allis silt loam	4	3
Appleton silt loam, 0 to 3 percent slopes	2	2
Appleton silt loam, 3 to 8 percent slopes	2	2
Appleton and Manheim very stony silt loams, 0 to 8 percent slopes	3	3
Bombay very fine sandy loam, 3 to 8 percent slopes	2	1
Bombay very fine sandy loam, 8 to 15 percent slopes	2	1
Broadalbin loam, 2 to 8 percent slopes	2	1
Broadalbin loam, 8 to 15 percent slopes	2	1
Broadalbin loam, 15 to 25 percent slopes	3	2
Broadalbin and Lansing extremely stony soils, 0 to 25 percent slopes	4	3
Burdett silt loam, 0 to 3 percent slopes	2	2
Burdett silt loam, 3 to 8 percent slopes	2	2
Burdett silt loam, 8 to 15 percent slopes	2	2
Canton stony very fine sandy loam, 2 to 8 percent slopes	2	1
Canton stony very fine sandy loam, 8 to 15 percent slopes	2	1
Carlisle muck	4	3
Cohoctah mucky very fine sandy loam	4	3
Conesus silt loam, 2 to 8 percent slopes	2	1
Farmington silt loam, 0 to 8 percent slopes	2	2
Farmington very rocky silt loam, 0 to 25 percent slopes	3	2
Farmington-Rock land complex, steep	4	4
Fredon fine sandy loam	2	2
Halsey soils	4	3
Hamlin fine sandy loam	2	1
Hamlin silt loam	2	1
Hartland-Agawam complex, 3 to 8 percent slopes	2	1
Hartland-Agawam complex, 8 to 15 percent slopes	2	1
Hartland-Agawam complex, 15 to 25 percent slopes	3	2
Herkimer gravelly silt loam, 0 to 3 percent slopes	1	1
Herkimer gravelly silt loam, 3 to 8 percent slopes	2	1
Herkimer gravelly silt loam, moderately well drained, 0 to 4 percent slopes	2	1
Hilton silt loam, 3 to 8 percent slopes	2	1
Hilton silt loam, 8 to 15 percent slopes	2	1
Hinckley gravelly loamy sand, 0 to 3 percent slopes	4	3
Hinckley gravelly loamy sand, 3 to 8 percent slopes	4	3
Hinckley gravelly loamy sand, 8 to 15 percent slopes	4	3
Hinckley and Windsor soils, 15 to 25 percent slopes	4	3
Hinckley and Windsor soils, 25 to 70 percent slopes	4	4
Honeoye silt loam, 3 to 8 percent slopes	2	1
Honeoye silt loam, 8 to 15 percent slopes	2	1
Honeoye silt loam, 15 to 25 percent slopes	3	2
Honeoye and Lansing silt loams, 25 to 35 percent slopes	4	3
Honeoye and Mohawk very stony silt loams, 0 to 25 percent slopes	3	2
Hornell silt loam, 0 to 3 percent slopes	2	2
Hornell silt loam, 3 to 8 percent slopes	2	2
Hornell silt loam, 8 to 15 percent slopes	2	2
Howard gravelly fine sandy loam, 0 to 3 percent slopes	2	1
Howard gravelly fine sandy loam, 3 to 8 percent slopes	2	1
Howard gravelly fine sandy loam, 8 to 15 percent slopes	2	1
Howard gravelly silt loam, 0 to 3 percent slopes	2	1
Howard gravelly silt loam, 3 to 8 percent slopes	2	1
Howard gravelly silt loam, 8 to 15 percent slopes	2	1
Howard and Palmyra soils, 15 to 25 percent slopes	3	2
Hudson silt loam, loamy substratum, 2 to 8 percent slopes	2	1
Hudson silt loam, loamy substratum, 8 to 15 percent slopes	2	1
Hudson silt loam, loamy substratum, 15 to 30 percent slopes	3	2
Ilion silt loam	4	3
Ilion and Sun very stony silt loams	4	3
Lairdsville silt loam, loamy subsoil variant, 3 to 8 percent slopes	2	1
Lairdsville silt loam, loamy subsoil variant, 8 to 15 percent slopes	2	1
Lairdsville silt loam, loamy subsoil variant, 15 to 25 percent slopes	3	2
Lamson mucky silt loam	4	3
Lansing silt loam, 8 to 15 percent slopes	2	1
Lansing silt loam, 15 to 25 percent slopes	3	2
Lima silt loam, 0 to 3 percent slopes	2	1
Lima silt loam, 3 to 8 percent slopes	2	1
Lima silt loam, 8 to 15 percent slopes	2	1
Lockport silt loam, loamy subsoil variant, 0 to 4 percent slopes	2	2

for wildlife habitat

Alluvial land; Cut and fill land; Fresh water marsh; Rough broken land; Sandstone rock land; and Shaly rock land, very steep]

Elements of wildlife habitat—Continued						Classes of wildlife		
Wild herbaceous upland plants	Hardwood plants	Coniferous plants	Wetland food and cover plants	Shallow diked impoundments	Shallow excavated impoundments	Openland	Woodland	Wetland
3	2	2	1	3	2	3	2	2
1	1	2	3	2	2	2	1	2
1	1	2	3	4	4	2	1	4
1	1	2	3	4	4	2	2	4
1	1	1	4	3	3	1	1	3
1	1	1	4	3	3	1	1	3
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
1	1	1	4	4	4	3	2	4
1	1	2	3	2	2	2	1	2
1	1	2	3	4	4	2	1	4
1	1	2	4	4	4	2	1	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
3	2	2	1	4	2	3	3	2
3	2	2	1	3	3	3	2	3
1	1	1	4	3	3	1	1	3
2	2	2	4	4	4	2	2	4
2	2	2	4	4	4	2	2	4
2	2	2	4	4	4	4	2	4
1	1	2	3	4	3	2	1	3
3	2	3	1	4	4	3	2	4
1	1	1	4	3	4	1	1	3
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	3	3	1	1	3
1	1	1	4	4	4	1	1	4
3	3	3	4	4	4	3	3	4
3	3	3	4	4	4	3	3	4
3	3	3	4	4	4	3	3	4
3	3	3	4	4	4	3	3	4
3	3	3	4	4	4	4	3	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
1	1	1	4	4	4	3	2	4
1	1	1	4	4	4	2	2	4
1	1	2	3	3	3	2	1	4
1	1	2	3	4	4	2	1	4
1	1	2	4	4	4	2	1	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	2	2	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
3	2	2	2	3	3	3	2	3
3	2	2	2	3	3	3	2	3
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
3	2	2	1	4	3	3	2	3
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
1	1	1	4	3	3	1	1	3
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	2	3	3	2	2	1	2

TABLE 3.—*Suitability of the soils*

Soil	Elements of wildlife habitat	
	Grain and seed crops	Grasses and legumes
Lyons mucky silt loam	4	3
Manheim silt loam, 0 to 3 percent slopes	2	2
Manheim silt loam, 3 to 8 percent slopes	2	2
Manheim silt loam, 8 to 15 percent slopes	2	2
Manlius shaly silt loam, 3 to 8 percent slopes	3	2
Manlius shaly silt loam, 8 to 15 percent slopes	3	2
Manlius shaly silt loam, 15 to 25 percent slopes	3	2
Massena very fine sandy loam, 0 to 8 percent slopes	2	2
Mohawk silt loam, shale substratum, 3 to 8 percent slopes	2	1
Mohawk silt loam, shale substratum, 8 to 15 percent slopes	2	1
Mohawk silt loam, shale substratum, 15 to 25 percent slopes	3	2
Mosherville very fine sandy loam, 2 to 8 percent slopes	2	2
Nassau silt loam, 3 to 8 percent slopes	2	2
Nassau silt loam, 8 to 15 percent slopes	2	2
Nassau silt loam, 15 to 25 percent slopes	3	2
Ontario silt loam, 3 to 8 percent slopes	2	1
Ontario silt loam, 8 to 15 percent slopes	2	1
Ontario silt loam, 15 to 25 percent slopes	3	2
Palatine silt loam, 2 to 8 percent slopes	2	1
Palatine silt loam, 8 to 15 percent slopes	2	1
Palatine silt loam, 15 to 25 percent slopes	3	2
Palms muck	4	3
Palmyra gravelly silt loam, 0 to 3 percent slopes	2	1
Palmyra gravelly silt loam, 3 to 8 percent slopes	2	1
Palmyra gravelly silt loam, 8 to 15 percent slopes	2	1
Palmyra and Howard soils, rolling	2	1
Palmyra and Howard soils, 25 to 70 percent slopes	4	4
Phelps gravelly fine sandy loam, 0 to 4 percent slopes	2	1
Raynham silt loam, 0 to 4 percent slopes	2	2
Rhinebeck silt loam, loamy substratum, 0 to 3 percent slopes	2	2
Rhinebeck silt loam, loamy substratum, 3 to 8 percent slopes	2	2
Sun mucky silt loam	4	3
Teel fine sandy loam	2	1
Teel silt loam	2	1
Wassaic silt loam, 0 to 3 percent slopes	2	2
Wassaic silt loam, 3 to 8 percent slopes	2	2
Wassaic silt loam, 8 to 15 percent slopes	2	2
Wassaic silt loam, 15 to 25 percent slopes	3	2
Wayland silt loam	4	3
Williamson silt loam, 0 to 3 percent slopes	2	1
Williamson silt loam, 3 to 8 percent slopes	2	1
Windsor loamy fine sand, 0 to 3 percent slopes	3	2
Windsor loamy fine sand, 3 to 8 percent slopes	3	2
Windsor loamy fine sand, 8 to 15 percent slopes	3	2

for wildlife habitat—Continued

Elements of wildlife habitat—Continued						Classes of wildlife		
Wild herbaceous upland plants	Hardwood plants	Coniferous plants	Wetland food and cover plants	Shallow diked impoundments	Shallow excavated impoundments	Openland	Woodland	Wetland
3	2	2	2	2	1	3	2	2
1	1	2	3	3	2	2	1	2
1	1	2	3	4	4	2	1	4
1	1	2	4	4	4	2	1	4
2	2	3	4	4	4	2	2	4
2	2	3	4	4	4	2	2	4
2	2	3	4	4	4	2	2	4
1	1	2	3	2	2	2	1	2
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
2	2	2	3	4	4	2	2	4
2	2	2	4	4	4	2	2	4
2	2	2	4	4	4	2	2	4
2	2	2	4	4	4	2	2	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	1	1	4
1	1	1	4	4	4	2	2	4
3	2	2	1	4	2	3	3	2
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	1	2	4
1	2	2	4	4	4	3	2	4
1	2	2	4	4	4	1	2	4
1	1	2	3	3	2	2	2	2
1	1	2	3	2	2	2	1	2
1	1	2	3	4	4	2	1	4
3	2	3	1	2	2	3	2	1
1	1	1	4	3	3	1	1	3
1	1	1	4	3	3	1	1	3
1	2	2	4	4	4	2	2	4
1	2	2	4	4	4	2	2	4
1	2	2	4	4	4	2	2	4
1	2	2	4	4	4	2	2	4
3	2	2	2	3	1	3	2	2
1	1	1	4	3	3	1	1	3
1	1	1	4	4	4	1	1	4
2	2	3	4	4	4	2	2	4
2	2	3	4	4	4	2	2	4
2	2	3	4	4	4	2	2	4

Shallow Diked Impoundments.—This habitat element is rated on the basis of the suitability of the soil for the construction of low dikes to impound shallow bodies of water. Included are marshes that receive surface runoff. Also included are flooded duck fields, or dry shallow impoundments, in which domestic grains are grown, and which are then flooded in fall with up to 18 inches of water from adjacent ponds or streams.

Detailed field investigations of soil and site are necessary to determine the feasibility of water developments. Soil features that affect use of the soils for reservoir areas and embankment materials for ponds are given in the section "Engineering Uses of the Soils." Fishponds are not included in this habitat element.

Shallow Excavated Impoundments.—This element consists of level ditches and potholes constructed in soils with high water tables to create open water areas, mostly for waterfowl.

Classes of wildlife

Each rating under openland, woodland, and wetland wildlife is based on the ratings listed for selected essential elements of habitat in the first part of the table, and the significance of these elements for that class of wildlife. The ratings for openland wildlife are based on the ratings for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood plants, and coniferous plants. The ratings for woodland wildlife are based on the ratings listed for all the above elements except grain and seed crops. Those for wetland wildlife are based on the ratings for wetland food and cover plants, shallow diked impoundments, and shallow excavated impoundments.

Openland Wildlife.—Examples of openland wildlife are pheasants, meadowlarks, field sparrows, doves, cottontail rabbits, red foxes, and woodchucks. These birds and mammals normally make their homes in areas of cropland, pasture, meadow, and lawns, and in areas overgrown with grasses, herbs, and shrubs.

Woodland Wildlife.—Among the animals that prefer woodland are ruffed grouse, woodcock, thrushes, vireos, scarlet tanagers, gray and red squirrels, gray foxes, white-tailed deer, and raccoons.

Wetland Wildlife.—Ducks, geese, rails, herons, shore birds, redwing blackbirds, mink, muskrats, and beaver are familiar examples of birds and mammals that normally make their homes around ponds, marshes, swamps, and other wet areas.

Engineering Uses of the Soils [7]

Some soil properties are of special interest to engineers because they affect the design, construction, and maintenance of roads, airports, pipelines, building foundations, and sewage disposal systems. Some of the properties important to engineers are permeability to water, shear strength, grain size, compaction characteristics, soil drainage, plasticity, and pH value. Relief, depth to the water table, depth to bedrock, and kind of bedrock are also important.

Information in this survey can be used to:

1. Make studies that will aid in selecting and developing sites for industrial, commercial, residential, and recreational purposes.
2. Make preliminary estimates of soil properties that are significant in the planning of agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables, and in planning detailed investigations of selected locations.
4. Locate probable sources of gravel and other construction material.
5. Correlate performance of engineering structures with soils and thus gain information that will be useful in planning design and in maintaining structures.
6. Determine the suitability of the soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and from aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works. Even in these situations, though, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Much of the information in this section is presented in the form of tables. Only the data in table 4 are from actual laboratory tests. Estimates of soil properties significant in engineering are given in table 5, and interpretations of engineering properties are given in table 6.

Terminology

Some of the terms used in this soil survey have a special meaning to soil scientists and different meaning to engineers. The Glossary defines many of these terms according to their meaning in soil science.

Following are definitions of some terms used in this section:

Compressibility.—The property of a soil determining its tendency to decrease in volume when subjected to load.

Liquid limit.—The moisture content at which the soil material passes from a plastic to a viscous, semiliquid state.

Moisture Content.—The ratio of the weight of water contained in the soil to the dry weight of the soil. It is generally expressed as a percentage.

Moisture-Density Relations.—If a soil material is compacted at a successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will increase until the

---

[7] Prepared by John B. Fleckenstein, senior agronomist, New York State Department of Transportation, Bureau of Soil Mechanics, and by Donald L. Basinger, assistant state conservation engineer, and Donald F. Flora, soil scientist, Soil Conservation Service.

optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density. The moisture-density relationship is important to earthwork, for, as a rule, optimum stability is obtained for any given compactive effort if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

PLASTIC LIMIT.—The moisture content at which the soil material passes from a semisolid to a plastic state.

PLASTICITY INDEX.—The numerical difference between the liquid limit and the plastic limit. The plasticity index indicates the range of moisture content within which a soil material is plastic.

SHEAR STRENGTH.—The ability to resist sliding along internal surfaces within a soil mass when external forces are applied.

SHRINK-SWELL POTENTIAL.—An indication of the volume change to be expected of the soil material with changes in moisture content.

STRENGTH.—The resistance to deformation of the soil mass by applied loads. In this survey it is expressed as the relative estimated load-carrying capacity, and should not be used for design purposes.

Engineering classification systems

In this section, soil texture is described according to the classification system used by the U.S. Department of Agriculture (*10*); the system used by the American Association of State Highway Officials (AASHO) (*2*); and the Unified system developed by the Corps of Engineers, U.S. Army (*12*).

In the system used by scientists of the U.S. Department of Agriculture, the texture of the soil horizon depends on the proportional amounts of different sized mineral particles, by volume. The percentage of soil material smaller than 2.0 millimeters determines the textural classes of fine earth such as loam, silt loam, and fine sandy loam. For soils in which 15 to 35 percent of the soil mass consists of particles larger than 2.0 millimeters, by volume, the textural classes are denoted by such names as gravelly loam or shaly silt loam. If more than 35 percent coarse fragments greater than 2 millimeters are present, the soils are given such names as very gravelly sandy loam or very shaly silt loam.

The AASHO system is based on the field performance of highways in relation to the gradation of particle sizes, liquid limit, and plasticity index of soil materials. Soils having about the same general load-carrying capacity are grouped together in seven basic groups, though the range in load-carrying capacity within each group is wide, and there is an overlapping of load-carrying capacity from one group to another. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrade) to A–7 (clayey soils having low bearing capacity when wet, the poorest soils for subgrade).

The Unified soil classification system is based on identification of soils according to their texture and plasticity and on their performance as engineering construction materials. In this system two letters are used to designate each of 15 possible classes. The letters G, S, C, M, and O stand for gravel, sand, clay, silt, and organic soils, respectively. The letters W, P, L, and H refer to well graded, poorly graded, low liquid limit, and high liquid limit, respectively. In this system, SM and GM are sands and gravels that include fines of silt; ML and CL are silts and clays that have a liquid limit below 50; and MH and CH are silts and clays that have a liquid limit about 50. If the soils are on the borderline between two classifications, a joint classification is used; for example, GM–GC.

Engineering test data

Table 4 presents data obtained by laboratory tests on samples of several soil series that are extensive in the survey area or are critical for engineering uses. The soils were sampled at one or more locations. These soils formed in highly variable glacial till and water-deposited materials, which range considerably in grain size (texture). Thus, the engineering soil classification given in table 4 will not apply to all parts of the mapped soil unit. The classification does apply to the soil as it occurs throughout most of its acreage in the survey area. In establishing the engineering soil classification, particles larger than 3 inches were not considered.

Estimated soil properties significant in engineering

Table 5 lists estimated properties of all of the soils in the survey area that are significant to engineers. The estimates in table 5 are based on test data shown in table 4, on information taken from the soil survey, and on knowledge gained through experience in using the soils for construction. The estimates in table 5 and interpretations in table 6 are generally to depths of 4 to 5 feet of the named soil series in the mapping units. Each soil area (mapping unit) contains small areas of other soils that may differ considerably from the soil for which the mapping unit is named. As a consequence, onsite checking of a site tentatively selected for any engineering applications is necessary.

Some of the items in table 5 need no explanation or have been previously discussed; others are explained in the following paragraphs.

Depth to bedrock.—The estimated depth to bedrock is based on observations made during the course of the survey. From place to place, the depth to bedrock may vary considerably.

Depth to seasonal high water table.—The shallowest ranges in depth are given at which free water can be encountered during frost-free periods. This may be a perched or other ground water table. Soil conditions immediately after heavy precipitation are not considered.

Depth from surface of representative profile.—The depths given in this column were taken from the profiles described as representative for the series in this survey area. These depths reflect significant changes in texture, density, or other soil features that have engineering significance.

Permeability.—Permeability estimates are indications of the rate at which water moves through undisturbed soil layers. The rate depends largely on the texture, porosity, and structure of each layer and is expressed in inches per hour. A rate of less than 0.2 inch per hour is slow; 0.2 to 0.63 inch, moderately slow; 0.63 to 2.0 inches, moderate; 2.0 to 6.3 inches, moderately rapid; and more than 6.3 inches, rapid.

525-444—75——4

TABLE 4.—*Engineering*

[Tests performed by the New York State Department of Transportation, Bureau of Soil Mechanics, in accordance with

Soil name and location	Parent material	SCS report No.	Depth from surface	Moisture density[1]: Maximum dry density	Moisture density[1]: Optimum moisture content	Moisture density[1]: Inplace dry density[4]	Moisture density[1]: Inplace moisture content[5]	Percolation rate[6]	Lineal shrinkage	Reaction	Organic matter[7]
			In.	*Lb./cu. ft.*	*Pct.*	*Lb./cu. ft.*	*Pct.*	*Min./in.*	*Pct.*	*pH*	*Pct.*
Bombay very fine sandy loam:											
Town of Norway, ¾ mile south of Norway, 400 feet east of Elm Tree Road. (Modal)	Very fine sand-silt mantle and underlying calcareous glacial till, dominated by fine sands and dark shale.	S65NY-22-11-1	0–10	83	33	71	35	------	6. 0	5. 9	8. 4
		11-2	10–16	93	26	82	27	------	4. 0	7. 8	1. 3
		11-3	16–41	100	22	88	25	>120	4. 2	8. 0	0. 8
		11-4	41–52	123	12	------	------	------	2. 2	8. 2	------
Town of Salisbury, 1¼ miles northwest of Salisbury, 1,300 feet west of Military Road. (Higher silt content in the surficial mantle than modal.)	Very fine sand-silt mantle and underlying glacial till derived from dark shale, very fine sands, granite, and sandstone and some limestone.	S64NY-22-12-1	0–9	87	27	------	37	------	5. 0	4. 2	6. 9
		12-2	9–19	87	31	------	41	------	3. 6	5. 0	4. 2
		12-3	19–32	116	14	------	17	------	2. 0	5. 8	0. 8
		12-4	32–56	120	12	------	16	------	2. 0	5. 8	------
Broadalbin loam:											
Town of Russia, 3 miles northwest of Russia, ¼ mile south of intersection of Black Creek and Forest Roads. (Modal)	Mantle and underlying glacial till derived from granite, gneiss, and dark shale.	S64NY-22-1-1	0–8	95	22	------	25	------	6. 4	6. 6	5. 8
		1-2 & 3	8–17	103	21	------	25	------	4. 0	6. 3	2. 4
		1-4	[11] 17–18								
		1-5 & 6	18–28	117	14	------	15	------	2. 0	6. 2	0. 7
		1-7	28–34	126	9	------	12	------	1. 0	6. 0	0. 4
		1-8	34–52	121	11	------	14	------	1. 6	5. 7	------
Town of Russia, 1 mile north of Military Road, 150 feet east of Hinckley Road. (Finer textured fragipan and C horizon than modal.)	Thin silt mantle and underlying glacial till derived from reworked silt and shale.	S65NY-22-8-1	0–7	82	34	73	34	------	6. 0	6. 2	5. 5
		8-2	7–12	97	21	------	------	------	4. 0	6. 0	3. 5
		8-3	12–19	114	15	101	17	9. 0	3. 8	6. 5	0. 9
		8-4	19–53	112	16	104	18	------	4. 4	6. 2	0. 4
		8-5	53–65	111	16	100	19	>120	6. 0	6. 6	------
Town of Russia, ¼ mile south of Military Road, 100 feet west of Beecher Road. (Thicker fragipan than modal.)	Mantle of silt and very fine sand, and underlying glacial till consisting of reworked silt and fine sand and some granitic gravel and fragments of dark shale.	S65NY-22-9-1	0–8	85	31	76	31	------	2. 4	5. 4	4. 8
		9-2	8–16	86	30	73	30	------	2. 0	5. 9	2. 2
		9-3	16–25	115	14	------	23	34. 0	2. 0	6. 7	1. 3
		9-4	25–50	113	15	106	19	------	2. 8	6. 8	0. 3
		9-5	50–63	123	12	------	21	0. 6	1. 4	7. 1	------
Burdett silt loam:											
Town of German Flatts, 1 mile west of Vrooman Road, 100 feet north of Shoemaker Road. (Modal)	Thin silty mantle and underlying calcareous glacial till dominated by dark shale.	S65-NY-22-15-1	0–9	93	24	78	27	------	5. 8	5. 4	4. 1
		15-2	9–13	113	15	------	------	------	3. 6	5. 9	1. 4
		15-3	[11] 13–16								
		15-4	16–29	111	16	104	17	>120	7. 6	5. 6	0. 7
		15-5	29–55	108	18	105	20	------	8. 4	6. 2	0. 6
		15-6	55–62	105	19	105	19	>120	7. 0	8. 1	------

See footnotes at end of table.

test data

standard procedures of the American Association of State Highway Officials (AASHO) (*2*). The symbol > means greater than]

Mechanical analysis [2] [3]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—						AASHO [8]	Unified
3 in.	1½ in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
											Pct.			
100	97	97	95	93	85	61	(9)	----	----	----	40	11	A-6(5)	ML or OL
----	100	98	94	92	83	54	52	31	14	7	23	6	A-4(4)	ML-CL
----	100	99	95	92	82	51	48	25	10	7	22	7	A-4(3)	CL
100	99	96	91	87	76	44	41	19	7	5	18	4	A-4(2)	SM-SC
----	----	100	99	98	92	67	(9)	----	----	----	----	(10)	A-4(6)	ML or OL
----	----	----	100	99	96	80	(9)	----	----	----	----	(10)	A-4(8)	ML
100	98	94	89	88	78	41	33	15	6	4	----	(10)	A-4(1)	SM
----	100	98	94	92	83	47	38	17	9	5	18	3	A-4(2)	SM
----	----	100	98	97	91	63	(9)	----	----	----	37	10	A-4(6)	ML or OL
100	97	97	95	93	87	58	46	17	5	3	26	5	A-4(5)	ML-CL
----	100	98	96	95	86	54	44	19	7	5	17	2	A-4(4)	ML
100	98	96	93	91	80	40	31	9	4	3	----	(10)	A-4(1)	SM
----	----	100	99	98	90	56	45	20	7	4	16	2	A-4(4)	ML
----	100	98	95	93	87	63	51	24	7	3	43	9	A-5(6)	ML or OL
----	100	97	93	91	83	60	49	26	9	4	36	9	A-4(5)	ML-CL
----	100	98	96	94	86	59	50	34	18	10	22	6	A-4(5)	ML-CL
----	99	98	95	94	87	57	50	33	18	11	22	7	A-4(4)	ML-CL
100	96	95	94	93	86	61	53	37	21	13	23	8	A-4(5)	CL
100	98	96	92	91	85	49	41	23	6	5	----	(10)	A-4(3)	SM
100	99	96	92	90	84	44	34	12	3	2	----	(10)	A-4(2)	SM
100	89	84	78	75	70	38	31	13	2	1	20	2	A-4(1)	SM
100	98	96	92	90	85	64	55	33	11	6	19	3	A-4(6)	ML
100	98	95	91	88	76	38	31	14	6	2	16	2	A-4(1)	SM
100	99	97	92	90	86	57	56	37	16	9	35	10	A-4(4)	ML-CL
100	98	96	92	88	81	47	45	22	10	7	21	4	A-4(3)	SM-SC
100	90	89	85	82	75	61	60	41	22	15	28	9	A-4(5)	CL
100	99	97	92	88	80	68	68	55	36	24	33	12	A-6(8)	CL
100	97	96	93	90	85	73	72	53	37	21	33	11	A-6(8)	ML-CL

TABLE 4.—*Engineering*

Soil name and location	Parent material	SCS report No.	Depth from surface	Moisture density [1]: Maximum dry density	Moisture density [1]: Optimum moisture content	Moisture density [1]: Inplace dry density [4]	Moisture density [1]: Inplace moisture content [5]	Percolation rate [6]	Lineal shrinkage	Reaction	Organic matter [7]
			In.	*Lb./cu. ft.*	*Pct.*	*Lb./cu. ft.*	*Pct.*	*Min./in.*	*Pct.*	*pH*	*Pct.*
Burdett silt loam—Con. Town of Schuyler, ¼ mile north of Windfall Road, 100 feet east of Spain Gulf Road. (Thinner and finer textured surficial mantle than modal.)	Thin silt mantle and underlying calcareous glacial till that has a high content of gray shale.	S65–NY–22– 3–1	0–7	83	33	71	39	--------	8. 2	5. 8	5. 6
		3–2	7–12	105	19	------	--------	--------	8. 0	5. 7	1. 6
		3–3	12–27	117	14	115	16	30. 0	8. 0	7. 5	0. 9
		3–4	27–43	121	12	114	15	--------	7. 6	8. 1	------
		3–5	[11] 43–46								
		3–6	46–60	126	11	123	14	>120	3. 2	7. 9	------
Town of Schuyler, ¼ mile east of Windfall Road, 100 feet southeast of Hawthorne Gulf Road. (Thinner surficial mantle than modal.)	Thin silt mantle and underlying calcareous glacial till that has a high content of gray shale.	S65–NY–22– 4–1	0–9	83	33	75	37	--------	7. 2	6. 5	6. 0
		4–2	[11] 9–12								
		4–3	12–27	116	14	115	17	>120	8. 0	7. 3	1. 0
		4–4	27–49	119	13	110	16	--------	6. 0	8. 4	------
		4–5	49–58	124	11	123	12	>120	5. 4	8. 5	------
Conesus silt loam: Town of Schuyler, 1¼ miles east of intersection of Shortlots and Windfall Roads.	Glacial till derived mainly from dark shale.	S64–NY–22–	[11] 0–5								
		4–2 & 3	5–11	108	17	------	18	--------	4. 4	4. 4	1. 5
			[12] 11–18								
		4–4	[11] 18–19								
			19–23	114	14	------	15	--------	4. 4	5. 0	0. 6
		4–5 & 6	[12] 23–35								
		4–7	35–55	114	15	------	18	--------	6. 4	6. 0	0. 7
		4–8	55–61	115	14	------	20	--------	8. 0	7. 4	------
Herkimer gravelly silt loam: Town of Schuyler, ¾ mile north of State Highway 5, 100 feet west of Woods Road. (Modal)	Glacial outwash fan material having high content of dark shale over multiple glacial sedimentary deposits.	S65–NY–22– 2–1	0–9	95	23	83	28	--------	8. 0	6. 1	5. 0
		2–2	9–31	105	20	86	23	2. 5	6. 6	6. 5	2. 1
		2–3	31–46	110	17	90	16	--------	6. 4	7. 0	1. 4
		2–4	46–67	115	14	98	16	--------	5. 8	7. 2	------
		2–5	67–74	122	11	------	--------	--------	1. 4	8. 1	------
		2–6	74–79	127	10	------	--------	--------	1. 0	8. 5	------
		2–7	79–86	130	9	120	11	>120	1. 4	7. 4	------
Town of Schuyler, 40 feet west of Carder Lane Road, ¼ mile south of Dutchtown Road. (Coarse side of textural range. Contains less gravel and more sand in the upper subsoil than modal.)	Old alluvial fan material having high content of dark shale.	S65–NY–22– 1–1	0–8	92	26	77	26	--------	7. 2	6. 0	5. 8
		1–2	8–15	105	19	84	17	--------	5. 6	5. 7	2. 1
		1–3	15–23	109	17	93	13	8. 0	5. 0	5. 7	1. 3
		1–4	23–45	105	19	87	16	--------	6. 4	6. 8	0. 5
		1–5	45–57	118	10	------	--------	--------	3. 8	7. 5	------
		1–6	57–71	120	13	86	13	0. 5	2. 6	8. 2	------
Town of Little Falls, ½ mile northwest of Kelhi Corners, 400 feet north of State Highway 169. (Finer textured subsoil than modal.)	Calcareous glacial outwash dominated by dark shale and some limestone, sandstone, and granitic material.	S65–NY–22– 13–1	0–9	89	28	72	32	--------	6. 0	6. 4	7. 3
		13–2	9–15	98	23	------	--------	--------	7. 4	6. 9	2. 1
		13–2	15–35	95	25	80	26	13. 8	6. 2	7. 6	2. 0
		13–4	35–55	120	13	99	10	0. 8	2. 0	7. 7	------

See footnotes at end of table.

test data—Continued

Mechanical analysis [2] [3]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—						AASHO [8]	Unified
3 in.	1½ in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
											Pct.			
------	100	97	92	89	85	74	(9)	------	------	------	49	14	A-7-5(12)	ML or OL
100	98	95	92	89	84	72	65	51	32	22	30	8	A-4(7)	ML-CL
100	97	93	88	83	74	61	54	40	23	17	31	12	A-6(6)	CL
100	96	93	82	75	66	53	48	38	24	16	27	9	A-4(4)	CL
100	97	92	80	74	62	46	40	29	16	9	22	7	A-4(2)	SM-SC
100	99	96	90	88	84	72	(9)	------	------	------	47	12	A-7-5(10)	ML or OL
100	99	98	94	89	80	66	61	45	26	19	30	11	A-6(6)	CL
100	99	95	86	80	69	55	49	36	18	11	25	8	A-4(4)	CL
100	99	95	86	80	69	52	48	38	25	18	22	7	A-4(3)	ML-CL
100	97	95	90	87	82	64	58	41	23	14	32	10	A-4(6)	ML-CL
------	100	95	89	85	78	60	53	34	22	12	26	9	A-4(5)	CL
100	99	95	88	83	75	60	54	37	23	14	28	10	A-4(5)	CL
100	98	96	90	83	74	58	51	35	22	14	27	9	A-4(5)	CL
100	96	91	79	74	67	57	53	43	24	13	44	12	A-7-5 (6)	ML
92	80	58	40	34	27	21	19	13	7	3	38	12	A-2-6 (0)	GM
100	80	65	48	42	32	23	20	15	7	4	32	10	A-2-4 (0)	GC
100	97	71	49	39	26	18	15	9	5	3	28	8	A-2-4 (0)	GC
100	99	96	91	88	82	59	48	22	9	6	19	3	A-4(5)	ML
100	97	92	80	72	64	47	38	18	6	4	18	2	A-4(2)	SM
87	82	72	55	49	39	27	23	14	6	5	14	5	A-2-4(0)	GM-GC
100	89	79	76	72	62	48	(9)	------	------	------	45	14	A-7-5(4)	SM
94	90	85	66	57	45	31	30	20	10	5	31	9	A-2-4(0)	SM-SC
94	87	82	72	66	51	34	32	25	14	8	28	9	A-2-4(0)	SC
100	96	75	58	53	44	35	32	21	13	9	35	12	A-2-6(0)	GM-GC
89	76	51	37	33	23	14	11	7	4	3	24	6	A-1-a(0)	GM-GC
100	94	72	48	38	24	12	10	5	2	2	19	1	A-1-a(0)	GW-GM
100	97	95	92	90	84	68	(9)	------	------	------	41	10	A-5(7)	ML or OL
100	99	93	89	86	78	63	62	36	14	8	34	8	A-4(6)	ML
100	99	94	83	78	61	45	44	25	12	9	37	11	A-6(2)	SM
97	83	73	58	50	35	18	17	7	4	3	19	5	A-1-b(0)	GM-GC

TABLE 4.—*Engineering*

Soil name and location	Parent material	SCS report No.	Depth from surface	Moisture density [1]: Maximum dry density	Moisture density [1]: Optimum moisture content	Moisture density [1]: Inplace dry density [4]	Moisture density [1]: Inplace moisture content [5]	Percolation rate [6]	Lineal shrinkage	Reaction	Organic matter [7]
			In.	*Lb./cu. ft.*	*Pct.*	*Lb./cu. ft.*	*Pct.*	*Min./in.*	*Pct.*	*pH*	*Pct.*
Hilton silt loam: Town of German Flatts, 3¼ miles southeast of village of Mohawk, ½ mile south of intersection of State Highway 168 and Pinebush Road.	Glacial till derived from red sandstone; black, red, and green shales and some limestone.	S64–NY–22–									
		8–1	[11] 0–5	----	----	----	----	----	----	----	----
		8–2	5–14	107	16	----	15	----	5.0	4.7	2.3
		8–3	[11] 14–18	----	----	----	----	----	----	----	----
		8–4	18–25	110	16	----	17	----	7.6	5.3	0.4
		8–5	25–38	109	17	----	21	----	9.6	5.3	0.5
		8–6	38–43	118	13	----	15	----	6.0	5.5	----
Hinckley gravelly loamy sand: Town of Russia, 2 miles northwest of Gravesville at intersection of two dirt roads. (Modal)	Glacial outwash having pockets of calcareous material at depth of 52 inches. Soil material predominantly granitic in origin, and some limestone.	S65–NY–22–									
		6–1	0–9	107	16	88	20	----	2.2	5.8	3.4
		6–2	9–14	116	15	----	----	----	2.0	6.6	2.9
		6–3	14–28	108	13	86	19	46.4	0.2	6.7	1.3
		6–4	28–40	120	10	99	9	----	1.4	6.8	0.8
		6–5	40–70	124	9	113	6	0.5	0.2	7.1	----
Town of Newport, 2 miles north of Newport-Gray Road, 150 feet west of Rose Valley Road. (Kame deposit; not as well sorted as modal.)	Kame deposits of outwash consisting of a mixture of granitic sandstone, limestone, and shale material.	S65–NY–22–									
		10–1	0–8	110	14	89	14	----	4.4	5.8	4.9
		10–2	[11] 8–14								
		10–3	[11] 14–17								
		10–4	[11] 17–19								
		10–5	19–25	116	12	----	----	2.1	0.0	7.3	----
		10–6	25–52	115	11	115	4	----	0.0	7.7	----
Town of Russia, 1⅓ miles east of Dover Road, 80 feet south of Simpson Road. (More gravel in the B horizons than modal.)	Glacial outwash from granitic sandstone and limestone material.	S65–NY–22–									
		7–1	0–9	100	22	78	22	----	4.0	5.9	5.8
		7–2	9–17	115	11	90	15	----	2.2	6.5	1.9
		7–3	17–26	123	12	99	10	1.4	3.2	6.4	1.6
		7–4	26–35	116	11	102	8	----	0.4	7.0	----
		7–5	35–50	113	11	98	11	----	0.0	7.0	----
		7–6	50–80	124	9	100	7	----	2.0	7.9	----
		7–7	80	132	9	----	----	----	2.4	8.1	----
Honeoye silt loam: Town of Columbia, 1 mile south of Getman Corners, 200 feet west of State Highway 28.	Calcareous glacial till, dominated by limestone, and some sandstone and shale.	S65–NY–22–									
		16–1	0–6	98	20	----	----	----	6.4	7.1	6.1
		16–2	6–9	107	18	----	----	----	4.0	7.3	1.8
		16–3	9–16	111	17	----	----	----	4.0	7.5	0.9
		16–4	16–27	110	17	84	19	1.3	6.2	7.7	1.0
		16–5	27–40	120	13	104	13	----	2.0	8.3	----
		16–6	40–66	127	10	----	----	----	1.6	8.4	----

See footnotes at end of table.

test data—Continued

Mechanical analysis [2] [3]													Classification	
Percentage passing sieve—							Percentage smaller than—				Liquid limit	Plasticity index	AASHO [8]	Unified
3 in.	1½ in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
											Pct.			
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
100	98	97	87	82	75	57	49	30	12	7	36	11	A-4(4)	ML-CL
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
100	99	98	92	88	79	61	54	38	27	19	30	10	A-4(5)	CL
100	98	95	89	84	78	66	59	43	32	23	34	14	A-6(8)	CL
100	98	93	84	79	70	49	44	30	19	12	22	7	A-4(3)	SM-SC
100	99	93	83	78	53	23	18	8	3	2	------	(10)	A-2-4(0)	SM
100	97	92	82	77	47	18	15	7	2	1	------	(10)	A-1-b(0)	SM
100	99	96	87	82	40	8	(13)	------	------	------	------	(10)	A-1-b(0)	SW-SM
------	100	93	79	73	29	9	(13)	------	------	------	------	(10)	A-1-b(0)	SW-SM
100	95	79	59	54	31	6	(13)	------	------	------	------	(10)	A-1-b(0)	SP-SM
100	91	86	77	73	48	19	18	12	6	4	29	7	A-2-4(0)	SM-SC
------	100	99	93	92	50	8	(13)	------	------	------	------	(10)	A-1-b(0)	SW-SM
100	96	85	65	60	23	2	(13)	------	------	------	------	(10)	A-1-b(0)	SW
100	82	74	63	58	42	24	(9)	------	------	------	37	7	A-2-4(0)	SM
95	80	68	52	47	28	14	10	6	3	2	------	(9)	A-1-a(0)	GM
95	87	78	42	32	18	9	(13)	------	------	------	18	1	A-1-a(0)	GM-GP
100	85	77	65	59	25	6	(13)	------	------	------	------	(9)	A-1-b(0)	SW-SM
------	100	97	86	77	34	7	(13)	------	------	------	------	(9)	A-1-b(0)	SM-SP
100	85	67	47	41	12	4	(13)	------	------	------	------	(9)	A-1-a(0)	GP
96	66	44	23	20	12	5	(13)	------	------	------	------	(9)	A-1-a(0)	GP-GM
100	97	92	89	87	81	66	(9)	------	------	------	43	11	A-7-5(7)	ML or OL
------	100	96	90	87	81	64	62	44	15	12	25	5	A-4(6)	ML-CL
100	95	91	85	83	78	61	59	34	13	5	22	4	A-4(5)	ML-CL
95	81	74	63	60	53	42	40	23	11	9	29	9	A-4(1)	GC
100	92	86	77	72	64	52	50	33	11	9	19	4	A-4(3)	ML-CL
100	96	88	74	66	54	40	39	22	8	5	18	3	A-4(1)	SM

TABLE 4.—*Engineering*

Soil name and location	Parent material	SCS report No.	Depth from surface	Moisture density [1]: Maximum dry density	Moisture density [1]: Optimum moisture content	Moisture density [1]: Inplace dry density [4]	Moisture density [1]: Inplace moisture content [5]	Percolation rate [6]	Lineal shrinkage	Reaction	Organic matter [7]
			In.	*Lb./cu. ft.*	*Pct.*	*Lb./cu. ft.*	*Pct.*	*Min./in.*	*Pct.*	*pH*	*Pct.*
Manheim silt loam: Town of German Flatts, 3½ miles east of village of Mohawk, ½ mile south of intersection of Shoemaker and Griffin Roads. (Modal)	Glacial till derived from dark shale, granite, and sandstone and some limestone.	S64–NY–22–9–1	0–9	90	24	------	17	--------	9. 0	6. 4	7. 0
		9–2	[11] 9–13								
		9–3 & 4	13–27 [12] 27–35	115	15	------	13	--------	7. 2	7. 1	0. 7
		9–5	35–45	118	13	------	15	--------	6. 4	7. 7	------
Town of Schuyler, 1¼ miles south of intersection of Upson and Steuben Hill Roads. (Bedrock substratum.)	Glacial till, high in dark shale, 40 inches thick over shale bedrock.	S64–NY–22–3–1	0–7	91	26	------	29	--------	7. 6	5. 0	5. 7
		3–2	7–14	104	19	------	23	--------	5. 4	5. 4	1. 5
		3–3	14–40	109	17	------	16	--------	9. 0	6. 9	0. 7
			[11] 40–43								
Town of Schuyler, ½ mile south of Hawthorne Gulf Road, 150 feet west of Mowers Road. (Fewer coarse fragments than modal.)	Calcareous glacial till having a high content of dark shale.	S65–NY–22–5–1	0–8	88	29	72	32	--------	9. 2	6. 1	7. 3
		5–2	8–12	109	17	------	------	--------	5. 0	6. 2	1. 8
		5–3	12–33	114	15	108	18	26. 0	6. 0	7. 4	0. 6
		5–4	33–59	117	14	115	18	--------	6. 0	8. 0	------
		5–5	59–69	120	13	126	12	>120	5. 0	8. 1	------
Town of Fairfield, 1½ miles north of Teel Road, 100 feet west of Hardscrabble Road. (Coarser textured B horizon than modal.)	Glacial till containing a medium amount of lime and consisting of fine and very fine sand and dark shale.	S65–NY–22–12–1	0–6	84	32	70	33	--------	6. 2	6. 0	9. 5
		12–2	6–14	86	31	75	31	--------	4. 8	6. 8	2. 5
		12–3	14–32	120	13	109	15	58. 0	4. 2	6. 4	0. 9
		12–4	32–36	120	13	------	------	--------	2. 8	7. 2	------
		12–5	36–65	113	15	108	18	--------	4. 4	7. 5	------
Mosherville very fine sandy loam: Town of Russia, 1¼ miles east of Russia on Russia Road, ½ mile west of intersection of Russia and Grant Roads. (Thinner fragipan and less acid than modal.)	Very fine sand-silt mantle and underlying glacial till derived from granite, gneiss, and dark shale.	S64–NY–22–2–1	0–8	92	23	------	32	--------	5. 2	5. 6	5. 5
		2–2	[11] 8–10								
		2–3	[11] 10–12								
		2–4	12–19	122	12	------	15	--------	3. 0	6. 5	0. 4
		2–5	[11] 19–26								
		2–6	26–52	120	13	------	18	--------	4. 4	7. 8	------
Rhinebeck silt loam, loamy substratum: Town of Fairfield, 2¼ miles west of intersection of Hardscrabble and Parkhurst Roads. (Modal)	Lacustrine clay cap over fine-textured glacial till having high content of dark shale.	S64–NY–22–11–1	0–6	87	28	------	23	--------	7. 6	5. 5	6. 1
		11–2	6–12	110	17	------	14	--------	5. 8	5. 6	1. 4
		11–3	12–30	98	25	------	26	--------	10. 4	7. 2	0. 7
		11–4	30–45	97	24	------	26	--------	10. 0	8. 0	------

See footnotes at end of table.

test data—Continued

Mechanical analysis [2] [3]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—						AASHO [8]	Unified
3 in.	1½ in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
											Pct.			
100	98	94	89	88	83	72	(9)	------	------	------	53	18	A-7-5(13)	MH or OH
100	99	94	85	79	70	59	52	37	24	15	28	11	A-6(5)	CL
100	99	93	82	76	66	53	48	35	22	14	26	10	A-4(4)	CL
--------	100	98	93	90	85	74	(9)	------	------	------	53	12	A-7-5(11)	MH or OH
--------	100	97	92	89	83	68	58	33	16	9	32	9	A-4(7)	ML-CL
--------	100	97	91	86	78	66	59	43	27	21	37	16	A-6(8)	CL
--------	--------	100	98	97	92	76	(9)	------	------	------	51	13	A-7-5(11)	MH or OH
100	98	97	93	91	90	63	57	42	20	13	27	8	A-4(6)	CL
--------	100	98	92	87	78	64	57	41	23	12	28	11	A-6(6)	CL
100	94	90	81	74	65	51	46	34	19	12	25	9	A-4(3)	CL
100	98	96	85	80	69	55	50	37	19	14	26	10	A-4(4)	CL
--------	100	99	96	94	88	67	(9)	------	------	------	41	12	A-6(8)	ML or OL
100	97	90	85	83	78	57	55	25	7	5	29	10	A-4(4)	CL
100	99	97	92	90	84	64	61	27	13	7	21	5	A-4(6)	ML or CL
--------	100	95	88	82	67	40	38	30	17	13	20	4	A-4(1)	SM
100	99	99	96	94	89	70	68	45	25	13	23	7	A-4(7)	CL
--------	100	97	93	92	87	69	(9)	------	------	------	46	12	A-7-5 (9)	ML or OL
100	99	97	90	86	78	54	44	21	9	7	19	5	A-4(4)	ML-CL
100	99	98	95	94	89	65	56	36	20	13	21	7	A-4(6)	ML-CL
100	99	99	97	97	94	85	(9)	------	------	------	48	18	A-7-5 (13)	ML or OL
--------	100	97	89	85	80	68	59	38	22	11	29	9	A-4(7)	CL
--------	--------	--------	100	99	98	97	92	81	63	48	50	26	A-7-6 (16)	CH
100	99	99	95	93	91	87	81	66	56	41	51	23	A-7-6 (15)	MH-CH

TABLE 4.—*Engineering*

Soil name and location	Parent material	SCS report No.	Depth from surface	Moisture density [1]: Maximum dry density	Moisture density [1]: Optimum moisture content	Moisture density [1]: Inplace dry density [4]	Moisture density [1]: Inplace moisture content [5]	Percolation rate [6]	Lineal shrinkage	Reaction	Organic matter [7]
			In.	*Lb./cu. ft.*	*Pct.*	*Lb./cu. ft.*	*Pct.*	*Min./in.*	*Pct.*	*pH*	*Pct.*
Windsor loamy fine sand: Town of Salisbury, 2¼ miles northeast of Salisbury Center, ½ mile south of State Highway 29A.	Fine and very fine glacial delta sands.	S65–NY–22– 14–1	0–6	95	23	------	------	--------	0. 8	4. 6	7. 0
		14–2	6–13	89	27	69	26	--------	2. 0	5. 6	5. 4
		14–3	13–26	103	15	80	13	1. 0	0. 0	5. 8	1. 7
		14–4	26–37	106	19	86	17	--------	0. 0	6. 0	1. 2
		14–5	37–52	102	15	87	9	--------	0. 0	6. 1	------
		14–6	52–60	100	15	95	9	1. 7	0. 0	6. 8	------

[1] Based on AASHO Designation T 99, Method C (*2*).

[2] Mechanical analyses according to the AASHO Designation T 88(*2*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fraction are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[3] Fragments larger than 3 inches in diameter were discarded in field sampling. The largest proportion of any sample discarded was 25 percent.

[4] Based on standard method of test for density of soil in place by the sand-cone method, ASTM Designation D1556–64 (*3*).

TABLE 5.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil. The soils in referring to other series that appear in the first column of this table. Alluvial land; Carlisle muck; Cut and fill land; Fresh water marsh; mated. The symbol > means more than;

Soil series and map symbols	Depth to—: Bedrock	Depth to—: Seasonal high water table	Depth from surface (typical profile)	Classification: Dominant USDA texture	Classification: Unified	Classification: AASHO
	Feet	*Feet*	*Inches*			
*Agawam: Mapped only in a complex with Hartland.	>6	>3½	0–30	Very fine sandy loam to fine sandy loam.	ML or CL, SM or SC	A–4 or A–2
			30–50	Loamy fine sand	SM	A–2
Allis: Aa	1½–3½	0–1	0–10	Silt loam, silty clay loam	ML or CL	A–7
			10–23	Silty clay	ML or CL	A–7
			23	Partly weathered shale bedrock.		
*Appleton: ApA, ApB, AtB[3]. For Manheim part of AtB, see Manheim series.	>6	½–1½	0–12	Silt loam	ML or CL	A–4
			12–27	Gravelly silt loam to gravelly loam.	GM or GC, ML or CL	A–6 or A–4
			27–50	Gravelly sandy loam	GM or GC	A–4
Bombay: BoB, BoC	>6	1½–2	0–16	Very fine sandy loam	ML or CL or OL	A–4 or A–5 or A–6
			16–41	Loam	SM, ML, or CL	A–4
			41–52	Gravelly loam	SM or SC, ML or CL	A–4
*Broadalbin: BrB, BrC, BrD, BsD[4]. For Lansing part of BsD, see Lansing series.	>6	1½–2½	0–18	Loam	ML or CL, SM or SC	A–4
			18–52	Fine sandy loam to sandy loam.	SM or SC, ML or CL	A–4

See footnotes at end of table.

test data—Continued

Mechanical analysis [2] [3]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—						AASHO [8]	Unified
3 in.	1½ in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
											Pct.			
100	98	96	93	92	83	35	(9)	------	------	------	------	(10)	A-2-4 (0)	SM
------	100	99	99	98	85	27	23	7	2	1	------	(10)	A-2-4 (0)	SM
93	87	81	73	70	60	25	21	5	2	1	------	(10)	A-2-4 (0)	SM
100	96	92	86	82	76	41	34	3	1	.3	------	(10)	A-4(1)	SM
------	------	------	------	------	100	42	29	1	------	------	------	(10)	A-4(1)	SM
------	------	------	------	------	100	43	32	1	------	------	------	(10)	A-4(2)	SM

[5] Laboratory determination of moisture content of soil in accordance with ASTM Designation D2216-63T (3).
[6] Based on "Standard Percolation Test," N.Y. State Dept. of Health, Bul. No. 1.
[7] Wet combustion method; based on Cornell University agronomy test procedure modified by the Bureau of Soil Mechanics.
[8] Based on AASHO Designation M 145-49.
[9] Hydrometer analysis not performed on soils that contain considerable organic matter, because of the flocculating effect.
[10] Nonplastic.
[11] Not sampled.
[12] Sampled as a composite.
[13] Hydrometer analysis not performed on sands if less than 10 percent passed the No. 200 sieve.

significant in engineering

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for Palms muck; Rough broken land; Sandstone rock land; and Shaly rock land, very steep, are so variable that their properties are not esti- the symbol < means less than]

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability	Available water capacity [1]	Reaction [2]
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)			
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*
0-2	90-100	90-100	70-90	30-65	2. 0-6. 3	0. 13-0. 17	5. 5-7. 3
0-5	90-100	90-100	45-75	10-30	>6. 3	0. 07-0. 08	5. 5-7. 3
0	75-100	70-95	65-95	50-85	. 63-2. 0	0. 12-0. 19	5. 0-6. 0
0	75-100	70-95	65-95	60-90	<. 20	0. 10-0. 16	5. 0-6. 0
0-10	85-95	80-90	70-90	55-80	. 63-2. 0	0. 15-0. 17	6. 5-7. 3
0-10	65-75	60-70	55-70	40-60	<. 63	0. 08-0. 15	6. 5-7. 6
5-10	60-70	55-65	50-60	40-50	<. 63	------------	7. 6
0-5	90-100	85-100	80-95	55-80	. 63-6. 3	0. 14-0. 20	5. 0-7. 3
2-10	90-100	85-95	75-90	40-60	. 20-2. 0	0. 07-0. 14	5. 5-7. 3
2-10	85-95	80-95	75-85	45-60	<. 63	------------	6. 5-7. 6
0-5	90-100	90-100	70-85	45-65	. 63-2. 0	0. 15-0. 17	5. 0-7. 3
2-10	80-100	75-95	60-80	40-60	<. 20	0. 10-0. 12	5. 0-7. 3

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface (typical profile)	Classification		
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Burdett: BuA, BuB, BuC	>6	½–1½	0–18	Silt loam and very fine sandy loam.	ML, CL, or SM	A–4 or A–7
			18–62	Shaly clay loam and shaly loam.	ML or CL, SM or SC	A–4 or A–6
Canton: CaB, CaC	>6	>3½	0–16	Very fine sandy loam	ML or CL, SM or SC	A–4
			16–29	Fine sandy loam	SM or SC	A–2 or A–4
			29–50	Loamy fine sand and gravelly loamy fine sand.	SM or SC, SW or SP	A–2
Cohoctah: Co [5]	>6	0–½	0–6	Mucky very fine sandy loam	ML or CL or OL	A–5 or A–6
			6–21	Very fine sandy loam to fine sandy loam.	ML or CL, SM or SC	A–4
			21–27	Loamy fine sand	SM or SC	A–2 or A–4
			27–50	Loam	ML or CL	A–4 or A–5
Conesus: CsB	>6	1½–2	0–19	Silt loam	ML or CL	A–4
			19–61	Gravelly heavy loam to silt loam.	ML or CL	A–4
Farmington: FaC, FcD,[6] FkE [6]	1–1½	>3	0–19	Silt loam	ML or CL	A–4
			19	Bedrock.		
Fredon: Fr	>6	½–1½	0–15	Fine sandy loam to gravelly fine sandy loam.	SM or SC	A–2 or A–4
			15–50	Very gravelly fine sandy loam to loamy sand.	GM or GC, GW or GP	A–1
Halsey: Ha	>6	0–½	0–6	Mucky silt loam	ML or CL or OL	A–4 or A–5
			6–20	Gravelly silt loam to silt loam	ML or CL or SM	A–4
			20–50	Gravelly loamy sand	SM or SW	A–1 or A–2
Hamlin: He, Hf [5]	>6	2–2½	0–51	Silt loam	ML or CL	A–4 or A–5
*Hartland: HgB, HgC, HgD. For Agawam part of HgB, HgC, and HgD, see Agawam series.	>6	>2½	0–21	Silt loam	ML or CL	A–4
			21–50	Very fine sandy loam	ML or CL or SM or SC	A–4
Herkimer: HhA, HhB, HkB	>6	1½–3½	0–9	Gravelly silt loam	SM or ML or OL	A–7, A–5
			9–46	Gravelly silt loam	GM or GC, SM or SC, ML	A–2 or A–4 or A–6
			46–75	Very gravelly or shaly loam	GM or GC, GW, ML	A–1, A–2 or A–4
Hilton: HlB, HlC	>6	1½–2	0–8	Silt loam	ML, CL or SM	A–4 or A–6
			8–15	Gravelly fine sandy loam	SM or SC	A–4
			15–36	Gravelly heavy silt loam	SM or SC, ML ML or CL	A–4 or A–6
			36–50	Gravelly silt loam	GM or GC, ML or CL	A–4
*Hinckley: HmA, HmB, HmC HnD, HnF. For Windsor part of HnD and HnF, see Windsor series. Estimates not given for material below 40 inches because it is variable.	>6	3½	0–28	Gravelly loamy sand	GM or GW, SM or SW or SC	A–1, A–2
			28–40	Very gravelly loamy sand	GW or GM, SW or SM	A–1
			40–70	Stratified gravel and sand.		

See footnotes at end of table.

significant in engineering—Continued

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability	Available water capacity[1]	Reaction[2]
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)			
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*
0–5	90–95	85–95	80–90	45–75	63–2. 0	0. 16–0. 18	5. 5–7. 3
2–10	80–95	75–90	60–85	45–75	<. 20	0. 12–0. 13	6. 5–7. 6
2–10	85–95	80–90	70–80	40–60	2. 0–6. 3	0. 11–0. 12	5. 0–7. 3
2–10	75–85	70–80	60–70	30–45	>2. 0	0. 09–0. 10	5. 5–7. 3
2–10	70–80	65–75	50–60	10–20	>6. 3	0. 05–0. 06	5. 5–7. 3
0–2	100	100	85–95	50–65	2. 0–6. 3	0. 13	6. 0–6. 5
0–2	100	100	70–95	45–60	2. 0–6. 3	0. 13	6. 0–7. 3
0–5	85–95	80–90	55–75	15–40	2. 0–6. 3	0. 08	6. 5–7. 3
0–5	90–100	85–95	75–90	50–65	2. 0–6. 3	----------	6. 5–7. 3
0–10	85–95	80–90	75–90	60–75	. 63–2. 0	0. 15–0. 17	5. 0–7. 3
0–10	80–90	70–80	60–80	55–75	<. 20	0. 13–0. 15	6. 5–7.
2–15	85–95	80–90	70–80	55–80	. 63–2. 0	0. 14–0. 16	6. 0–7. 3
0–10	65–95	60–90	40–70	25–50	>2. 0	0. 08–0. 12	6. 5–7. 6
0–10	30–40	25–35	15–30	10–20	>6. 3	0. 03–0. 05	>7. 6
0–10	95–100	90–100	80–100	65–90	. 63–2. 0	0. 18–0. 24	6. 0–7. 3
0–10	70–90	65–85	60–85	45–75	. 63–2. 0	0. 07–0. 13	6. 0–7. 3
0–10	70–80	65–75	35–55	10–20	>6. 3	0. 04–0. 05	6. 0–7. 6
0	100	100	90–100	70–85	. 63–2. 0	0. 18–0. 20	6. 0–7. 5
0–2	95–100	95–100	85–95	65–85	. 63–2. 0	0. 17–0. 18	5. 0–7. 3
0–2	95–100	95–100	80–95	45–65	. 63–2. 0	0. 12–0. 13	5. 0–7. 3
0–5	75–95	70–90	60–85	45–70	. 63–2. 0	0. 12–0. 13	5. 0–7. 3
0–5	40–90	35–85	25–80	20–60	. 63–2. 0	0. 07–0. 09	5. 0–7. 3
2–10	35–90	30–90	20–80	10–60	. 63–6. 3	----------	6. 5–7. 6
0–10	85–95	80–90	70–90	45–80	. 63–2. 0	0. 12–0. 13	5. 0–7. 3
0–10	70–90	65–85	55–75	35–50	. 63–6. 3	0. 08–0. 09	5. 0–7. 3
2–10	70–90	65–80	55–75	40–65	. 20–2. 0	0. 11–0. 13	6. 0–7. 3
2–10	60–80	55–80	50–70	40–55	<. 20	----------	6. 5–7. 6
2–10	50–90	45–85	25–55	5–25	>6. 3	0. 06–0. 07	4. 5–7. 3
2–10	40–80	30–75	15–30	5–15	>6. 3	0. 03	5. 5–7. 6

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface (typical profile)	Classification		
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
*Honeoye: HoB, HoC, HoD, HrE, HsD.[3] For Lansing part of HrE, and Mohawk part of HsD, see the respective series.	>6	>2½	0–9	Silt loam	OL or ML or CL	A–7, A–4
			9–27	Gravelly silt loam	GM or GC, SM or SC, ML or CL	A–4
			27–66	Dense gravelly silt loam	SM or SC, ML or CL	A–4
Hornell: HtA, HtB, HtC	1½–3½	½–2	0–6	Silt loam	ML or OL	A–7
			6–22	Shaly silty clay loam to shaly silty clay.	ML or CL	A–6 or A–7
			22	Shale bedrock.		
*Howard: HuA, HuB, HuC, HvA, HvB, HvC, HwD. For Palmyra part of HwD, see the Palmyra series.	>6	>3½	0–8	Gravelly silt loam	ML or CL, GM or GC	A–2 or A–4
			8–13	Gravelly sandy loam	SM or SC	A–2 or A–4
			13–29	Very gravelly sandy loam	GM or GC, GW or GP	A–1
			29–50	Very gravelly loamy fine sand.	GM, GW or GP	A–1
Hudson: HyB, HyC, HyD. Estimates not given for material below 41 inches because it is variable.	>3½	1½–2	0–16	Silt loam	ML or CL	A–7
			16–41	Silty clay loam to silty clay	ML or CL	A–7
*Ilion: In, Is[3]. For Sun part of Is, see the Sun series.	>3½	0–½	0–9	Silt loam	MH or OH	A–7
			9–29	Silty clay loam	ML or CL	A–4 or A–6
			29–50	Shaly silt loam to gravelly silt loam.	ML or CL	A–4
Lairdsville, loamy subsoil variant: LaB, LaC, LaD.	1½–3½	1½–2½	0–12	Silt loam to shaly silt loam	ML or CL	A–4
			12–28	Shaly silt loam	ML or CL	A–4
			28	Red shale bedrock.		
Lamson: Lk	>6	0–½	0–9	Mucky silt loam	ML or CL or OL	A–4
			9–34	Fine sandy loam, very fine sandy loam.	SM or ML	A–4
			34–50	Fine sandy loam	SM or ML	A–4
Lansing: LnC, LnD	>6	2–2½	0–9	Silt loam	ML or CL	A–4
			9–31	Gravelly silt loam	CL or ML	A–4
			31–42	Gravelly very fine sandy loam.	SM or ML	A–2 or A–4
			42–50	Dense gravelly silt loam	ML or CL	A–4
Lima: LoA, LoB, LoC	>6	1½–2	0–15	Silt loam	ML or CL or OL	A–7
			15–31	Gravelly silt loam	ML or CL, GM or GC	A–2 or A–4
			31–45	Dense gravelly silt loam.	GM or GC	A–2 or A–4
Lockport, loamy subsoil variant: LpB.	1½–3½	½–1½	0–10	Silt loam	ML or CL	A–4
			10–18	Silty clay loam	ML or CL	A–4
			18–23	Shaly silt loam	ML or CL	A–4
			23–28	Silt and shale	GM or GC	A–1 or A–2
			28	Shale bedrock.		
Lyons: Ly	>6	0–½	0–6	Mucky silt loam	ML or OL	A–4
			6–19	Silt loam	ML or CL	A–4
			19–24	Gravelly silt loam	ML or CL	A–4
			24–50	Dense gravelly silt loam	ML or CL or GM or GC	A–4

See footnotes at end of table.

significant in engineering—Continued

Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity [1]	Reaction [2]
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*
0-5	90-95	85-90	75-90	60-70	. 63-2. 0	0. 15-0. 16	6. 0-7. 3
2-10	60-90	55-85	50-80	40-60	. 63-2. 0	0. 10-0. 15	6. 0-7. 6
2-10	70-80	65-75	55-70	40-55	<. 20	----------	>7. 6
0-5	95-100	90-95	80-90	75-85	. 63-2. 0	0. 16-0. 17	5. 0-5. 5
0-5	75-85	70-80	65-80	60-75	<. 20	0. 11-0. 14	5. 0-5. 5
0-10	45-75	40-70	35-60	30-55	. 63-6. 3	0. 07-0. 13	5. 0-6. 5
0-10	70-80	60-70	40-65	25-40	. 63-6. 3	0. 08-0. 09	5. 0-6. 5
0-10	30-40	25-35	15-30	10-20	. 63-6. 3	0. 03-0. 05	5. 5-7. 3
0-10	25-35	20-30	10-25	5-15	>6. 3	0. 02	6. 5-7. 6
0-2	95-100	95-100	85-100	80-90	. 63-2. 0	0. 17-0. 18	5. 0-6. 0
0-2	100	95-100	85-100	85-95	<. 20	0. 12-0. 15	6. 0-7. 6
0-10	95-100	95-100	85-100	70-80	. 63-2. 0	0. 17-0. 18	5. 5-7. 3
0-10	90-95	85-90	75-90	60-70	<. 63	0. 12-0. 13	5. 5-7. 3
0-10	80-85	70-75	55-70	50-55	<. 20	----------	6. 5-7. 6
0-5	75-85	70-80	60-80	55-75	. 63-2. 0	0. 13-0. 14	5. 0-7. 3
0-10	65-75	60-70	55-70	55-65	<. 63	0. 11-0. 13	5. 5-7. 6
0-2	100	100	90-100	70-90	. 63-2. 0	0. 18-0. 24	6. 1-7. 3
0-2	100	100	85-95	45-60	. 63-2. 0	0. 13	6. 1-7. 3
0-2	100	100	70-85	45-55	. 63-2. 0	----------	>7. 6
0-5	90-95	85-95	75-95	60-80	. 63-2. 0	0. 18	5. 5-7. 3
0-10	75-85	70-80	65-80	55-70	. 63-2. 0	0. 11-0. 16	5. 5-7. 3
2-10	65-85	60-80	45-75	30-55	. 63-2. 0	0. 08-0. 09	5. 5-7. 3
2-10	85-95	80-90	65-90	55-80	<. 20	----------	7. 4-7. 6
0-5	85-95	80-90	65-90	60-70	. 63-2. 0	0. 14-0. 16	6. 0-7. 3
0-10	65-75	60-70	55-70	35-65	. 63-2. 0	0. 07-0. 09	6. 5-7. 6
0-10	50-60	45-55	40-55	30-45	<. 20	----------	>7. 6
0-2	95-100	95-100	85-100	70-85	. 63-2. 0	0. 17-0. 18	5. 5-7. 3
0-5	95-100	95-100	85-100	75-90	<. 63	0. 14-0. 15	5. 5-7. 3
0-5	65-75	60-70	50-70	50-65	<. 63	0. 11-0. 13	5. 5-7. 3
0-10	25-30	20-25	15-25	15-20	>2. 0	----------	5. 5-7. 6
0-10	90-100	85-95	75-95	60-80	. 63-2. 0	0. 16-0. 20	6. 0-7. 3
0-10	90-100	85-95	75-95	65-85	. 63-2. 0	0. 16-0. 17	7. 3-7. 6
2-10	80-90	75-85	70-85	55-70	. 63-2. 0	0. 12-0. 13	7. 3-7. 6
2-10	65-75	60-70	50-70	45-60	<. 20	----------	>7. 6

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface (typical profile)	Classification		
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Manheim: McA, McB, McC	>3½	½–1½	0–8	Silt loam	ML or OL, MH and OH	A–7, A–6
			8–18	Silt loam	ML or CL	A–4
			18–28	Silty clay loam	ML or CL	A–4, A–6
			28–50	Silt loam, shaly silt loam	ML or CL	A–4
Manlius: MlB, MlC, MlD	1½–3½	>3½	0–14	Shaly silt loam	ML or CL	A–4
			14–36	Very shaly silt loam	GM or GC	A–1 or A–2
			36	Shale bedrock.		
Massena: MnB	>6	0–1	0–16	Very fine sandy loam	SM or SC, ML or CL	A–4
			16–36	Gravelly loam to gravelly silt loam.	SM or SC, ML or CL	A–4
			36–50	Silt loam, till	ML or CL	A–4
Mohawk: MoB, MoC, MoD	3½–5	2–2½	0–18	Silt loam	ML or CL	A–4
			18–35	Heavy silt loam to shaly silt loam.	ML or CL	A–4 or A–6
			35–45	Shaly silt loam	ML or CL, GM or GC, SM or SC	A–2 or A–4
			45	Shale bedrock.		
Mosherville: MsB	>6	½–1½	0–21	Very fine sandy loam	ML, CL, OL, SM or SC	A–4 or A–7
			21–29	Fine sandy loam	SM or SC, ML or CL	A–2 or A–4
			29–50	Silt loam	ML or CL, SM or SC	A–4, A–2
Nassau: NaB, NaC, NaD	1–2	>2	0–6	Silt loam	ML or CL	A–4
			6–19	Shaly to very shaly silt loam	GM or GC	A–1 or A–2
			19	Shale bedrock.		
Ontario: OnB, OnC, OnD	>3½	>2½	0–9	Silt loam	ML or CL	A–4
			9–31	Gravelly silt loam, gravelly loam.	GM or GC, ML or CL	A–2 or A–4
			31–50	Dense gravelly silt loam	GM or GC	A–4
Palatine: PaB, PaC, PaD	1½–3½	>2½	0–7	Silt loam	ML or CL	A–4
			7–22	Very shaly silt loam	ML or CL	A–4
			22	Fractured soft shale bedrock.		
*Palmyra: PlA, PlB, PlC, PmC, PmF. For Howard part of PmC and PmF, see the Howard series. Some estimates are not given for depths below 36 inches because the material is variable.	>6	>3½	0–9	Gravelly silt loam	SM or SC, GM or GC	A–2 or A–5
			9–17	Gravelly very fine sandy loam.	SM or SC, GM or GC	A–2 or A–4
			17–27	Gravelly silt loam	ML or CL, GM or GC, SM or SC	A–2 or A–4
			27–36	Very gravelly silt loam	GM or GC	A–1 or A–2
			36–60	Stratified gravel and sand	------------	------------
Phelps: PpB. Some estimates are not given for depths below 36 inches because the material is variable.	>6	1½–2	0–11	Gravelly fine sandy loam	GM or GC	A–4 or A–2
			11–18	Gravelly loamy fine sand	GM or GC, GW or GP	A–1, A–2
			18–28	Gravelly fine sandy loam	GM or GC	A–1
			28–36	Very gravelly loamy sand	GM or GC, GW or GP	A–1
			36–50	Stratified sand and gravel	------------	------------
Raynham: RaB	>6	½–1½	0–9	Silt loam	ML or CL or OL	A–5 or A–6
			9–56	Silt loam	ML or CL	A–4

See footnotes at end of table.

significant in engineering—Continued

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability	Available water capacity [1]	Reaction [2]
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)			
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*
0–5	90–100	85–95	80–95	65–75	.63–2.0	0.17–0.20	5.5–7.3
0–10	85–95	80–90	75–90	55–70	.63–2.0	0.15–0.17	5.5–7.3
0–10	85–95	80–90	70–85	60–65	.63–2.0	0.12–0.13	5.5–7.3
0–10	80–90	70–80	60–75	55–60	<.20	------	6.5–7.6
0–2	75–85	65–75	60–75	55–60	.63–2.0	0.12–0.13	4.5–5.5
0–2	35–50	30–45	25–35	15–30	.63–2.0	0.05–0.08	5.0–6.5
0–5	90–100	90–95	75–90	45–60	.63–2.0	0.12–0.13	5.5–7.3
0–10	65–80	60–75	55–75	40–55	.63–2.0	0.08–0.13	5.5–7.3
0–10	85–95	80–90	75–90	55–70	<.20	------	6.5–7.6
0–5	95–100	90–95	75–90	65–75	.63–2.0	0.17–0.18	6.0–7.3
0–5	75–80	70–75	60–75	55–60	.63–2.0	.13	6.5–7.6
0–5	65–75	55–65	50–65	40–60	<.20	------	7.6
0–10	85–95	80–95	70–85	45–70	.63–6.3	0.09–0.11	5.0–6.5
2–10	80–90	75–85	55–75	35–60	<.20	------	5.0–7.3
2–10	75–95	60–95	45–90	35–65	<.20	------	6.0–7.3
0–5	80–90	75–85	60–80	50–75	.63–2.0	0.13–0.15	4.5–6.0
0–10	35–50	30–45	25–40	20–35	.63–2.0	0.05–0.08	4.5–6.0
0–5	85–95	80–90	65–90	55–70	.63–2.0	0.14–0.16	5.5–7.3
2–10	45–65	40–60	35–55	30–55	.63–2.0	0.07–0.11	5.5–7.3
2–10	60–70	55–65	45–65	40–50	<.20	------	6.5–7.6
0–2	90–100	85–95	75–90	60–85	.63–2.0	0.15–0.17	6.5–7.3
0–2	80–90	75–85	65–85	50–75	.63–2.0	0.13–0.15	6.5–7.6
0–5	60–80	50–75	55–70	30–50	.63–6.3	0.10–0.13	6.0–7.3
0–10	60–80	50–75	45–60	25–45	.63–6.3	0.07–0.10	6.0–7.3
2–10	60–80	50–75	55–70	35–55	.63–6.3	0.09–0.13	6.5–7.6
2–10	30–40	25–35	20–35	15–25	.63–6.3	0.05–0.06	7.6
2–10	------	------	------	------	>6.3	------	7.6
0–5	55–65	50–60	40–50	30–45	.63–2.0	0.07–0.08	6.0–7.3
0–10	40–50	35–45	25–40	10–20	>6.3	0.03	6.0–7.3
2–10	45–55	40–50	15–25	15–25	.63–2.0	0.05–0.07	6.0–7.6
2–10	30–40	20–30	10–25	5–15	>6.3	------	6.5–7.6
2–10	------	------	------	------	>6.3	------	>7.6
0–2	95–100	90–100	90–100	55–80	.20–6.3	0.16–0.20	5.6–7.3
0–2	95–100	90–100	90–100	55–80	>.20–2.0	0.16–0.18	5.6–7.6

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface (typical profile)	Classification: Dominant USDA texture	Classification: Unified	Classification: AASHO
	Feet	*Feet*	*Inches*			
Rhinebeck: RbA, RbB	>3½	½–1½	0–12	Silt loam	MH, OL, ML or CL	A–4 or A–7
			12–50	Silty clay loam to silty clay	MH or CH	A–7
			50–60	Gravelly silt loam	SM, SC, ML, CL, MH, CH	A–4
Sun: Sm	>6	0–½	0–8	Mucky silt loam	ML or CL or OL	A–5 or A–6
			8–32	Very fine sandy loam to fine sandy loam.	ML or CL, SM or SC	A–4
			32–50	Dense gravelly loam	ML or CL, GM or GC	A–4
Teel: Te[5], Ts[5]	>3½	1–2	0–11	Silt loam	ML or CL or OL	A–5 or A–6
			11–55	Silt loam	ML or CL	A–4
Wassaic: WaA, WaB, WaC, WaD	1½–3½	>3½	0–7	Silt loam or loam	ML or CL	A–4
			7–28	Gravelly silt loam	SM or SC, ML or CL	A–4
			28	Limestone bedrock.		
Wayland: Wd[5]	>6	0–1	0–12	Silt loam	ML or CL or OL	A–4 or A–6
			12–28	Silt loam to silty clay loam	ML or CL	A–4 or A–6
			28–33	Gravelly silt loam	ML or CL	A–4
			33–51	Silty clay loam	ML or CL	A–4 or A–6
Williamson: WlA, WlB	>6	1½–2	0–27	Silt loam to very fine sandy loam.	ML or CL	A–4
			27–40	Silt loam	ML or CL	A–4
			40–50	Varved silt and very fine sands	ML or CL	A–4
Windsor: WnA, WnB, WnC	>6	>3½	0–50	Loamy fine sand and fine sand	SM	A–1, A–2, A–4

[1] Estimates generally are given to a depth of 30 inches, or to the depth of rooting if less than 30 inches.
[2] A single pH value of 7.6 indicates that free carbonates are present and that the layer is calcareous.
[3] Fragments larger than 10 inches in diameter make up 1.5 to 50 cubic yards per acre foot of the profiles of AtB, HsD, and Is.

significant in engineering—Continued

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability	Available water capacity[1]	Reaction[2]
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)			
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*
0–2	90–100	85–100	80–95	65–85	.63–2.0	0.17–0.18	5.5–7.3
0–2	100	95–100	95–100	95–100	<.20	0.12–0.15	5.5–7.6
0–10	75–95	70–95	60–90	45–85	<.20–6.3	----------------	>7.6
0–10	90–100	85–95	75–90	60–85	.63–2.0	0.14–0.18	6.0–7.3
2–10	85–95	80–90	55–80	40–55	.63–2.0	0.11–0.12	6.5–7.6
2–10	65–75	60–70	50–70	45–60	<.63	----------------	7.3–7.6
0	100	100	90–100	70–80	.63–2.0	0.18–0.20	6.0–7.3
0–2	95–100	95–100	90–100	65–75	.63–2.0	0.17–0.18	6.0–7.6
0–10	85–95	85–95	75–90	60–70	.63–2.0	0.15–0.17	5.5–7.3
2–10	70–80	65–75	60–75	40–55	.63–2.0	0.13–0.15	5.5–7.6
0	100	100	90–100	70–90	.63–2.0	0.18–0.20	6.0–7.3
0–2	100	100	90–100	80–95	.20–.63	0.15–0.18	6.0–7.6
0–5	70–80	65–75	60–75	55–70	.63–2.0	----------------	6.0–7.6
0–2	100	100	95–100	85–95	<.20	----------------	6.0–7.6
0	95–100	95–100	85–100	55–85	.63–2.0	0.18	5.0–6.0
0–2	95–100	95–100	90–100	60–85	<.63	----------------	5.0–6.0
0–2	95–100	95–100	75–100	75–95	<.63	----------------	5.5–7.3
0–2	85–100	80–100	65–90	20–40	>6.3	0.04–0.08	4.5–6.0

[4] Fragments larger than 10 inches in diameter make up 50 to 240 cubic yards per acre foot of the profile of BsD.
[5] Subject to flooding.
[6] Bedrock is exposed in 10 to 25 percent of the surface area in unit FcD and in 25 to 80 percent of the surface area in unit FkE.

TABLE 6.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil. The soils for referring to other series that appear

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
*Agawam: Mapped only in a complex with Hartland soils. See Hartland series for interpretations.					
Allis: Aa	Poor: clayey; some shale fragments.	Unsuitable: none present.	Poor: thin deposits; 1½ to 3½ feet deep over shale bedrock; plastic material; wet in places.	Seasonal high water table less than 1 foot below surface; shale bedrock 1½ to 3½ feet below surface; rock in most cuts; cut slopes subject to seepage and sloughing above rock; subgrade in cuts subject to frost problems. Trafficability poor when wet.	Generally adequate strength for high embankments.
Alluvial land: Ad	Good to poor: variable texture; wet in places.	Generally unsuitable.	Variable: wet in places.	Floods frequently; high water table; variable subgrade soils; generally wet and unstable.	Variable strength; some areas underlain by wet, compressible soils.
Appleton: ApA, ApB	Fair to poor: too gravelly in places.	Unsuitable: none present.	Good to fair: seasonally wet; some large stones.	Seasonal high water table ½ to 1½ feet below surface. Cut slopes subject to seepage and sloughing; trafficability fair to poor when wet.	Generally adequate strength for moderately high embankments.
*Appleton: AtB. Interpretive information applies to both Appleton and Manheim soils in this unit.	Poor: very stony.	Unsuitable: none present.	Good to fair: many large stones; seasonally wet.	Seasonal high water table ½ to 1½ feet below surface; cut slopes subject to seepage and sloughing; trafficability fair to poor when wet.	Generally adequate strength for moderately high embankments.

See footnotes at end of table.

interpretations

in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions in the first column of this table]

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Adequate strength; seasonal high water table less than 1 foot below surface; shale bedrock 1½ to 3½ feet below surface.	Shale bedrock 1½ to 3½ feet below surface.	Shale bedrock 1½ to 3½ feet below surface; low yield; stability fair to poor; slow permeability; wet in places.	Seasonal high water table less than 1 foot below surface; shale bedrock 1½ to 3½ feet below surface; slowly permeable.	Not suitable for irrigation: poorly drained to somewhat poorly drained.	Diversions not needed; nearly level.	Not suitable for waterways; nearly level.
Floods frequently; high water table; some areas underlain by wet, compressible soils.	Variable permeability; floods frequently.	Variable material; wet in places.	Floods frequently; high water table; variable texture and permeability; outlets inadequate in places.	Not suitable for irrigation: floods frequently.	Diversions not needed: nearly level; floods frequently.	Not suitable for waterways: nearly level; floods frequently.
Seasonal high water table ½ to 1½ feet below surface; generally adequate strength and low compressibility.	Moderately slow or slow permeability below about 1 foot; seasonal high water table ½ to 1½ feet below surface.	Good stability; slow permeability; some large stones.	Moderately slow or slow permeability below about 1 foot; seasonal high water table ½ to 1½ feet below surface; ditchbanks subject to seepage and sloughing.	Moderate to slow water intake rate; seasonal high water table ½ to 1½ feet below surface; drainage needed; moderate to high available water capacity.	Moderately slow or slow permeability below about 1 foot; subject to prolonged flow.	Ditchbanks subject to seepage and sloughing; subject to prolonged flow; somewhat poorly drained.
Generally adequate strength and low compressibility; seasonal high water table ½ to 1½ feet below surface; many large stones.	Moderately slow or slow permeability; seasonal high water table ½ to 1½ feet below surface; many large stones.	Good stability; slow permeability; many large stones.	Generally not suitable for agricultural drainage; very stony.	Generally not suitable for irrigation: very stony.	Moderately slow or slow permeability; subject to prolonged flow; many large stones.	Ditchbanks subject to seepage and sloughing; subject to prolonged flow; somewhat poorly drained; many large stones.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Bombay: BoB, BoC	Fair to good: contains gravel in places.	Unsuitable: none present.	Surface mantle fair: highly erodible where used alone. Underlying glacial till good; some large stones.	Seasonal high water table 1½ to 2 feet below surface: surface mantle highly erodible in cuts; cut slopes subject to seepage and sloughing; subgrade in cuts subject to severe differential frost heaving in surface mantle; subgrade in till generally good; subject to boulder heaving in places; trafficability variable.	Generally adequate strength for high embankments.
Broadalbin: BrB, BrC, BrD	Fair to good: erodible.	Unsuitable: none present.	Surface mantle poor when used alone; underlying material good; some large stones.	Seasonal high water table 1½ to 2½ feet below surface; surface mantle highly erodible in cuts; cut slopes subject to seepage and sloughing; boulders lose embedment in places; subgrade in cuts subject to severe differential frost heaving in surface mantle; subgrade in underlying material generally good but in places subject to boulder heaving; BrD moderately steep; trafficability variable.	Generally adequate strength for moderately high embankments; BrD moderately steep.
BsD. Except for extremely stony feature and in some instances slope, see Lansing series for properties of Lansing part of unit BsD and Broadalbin series for Broadalbin part.	Poor: extremely stony.	Unsuitable: none present.	Fair: extremely stony and in places bouldery.	Stones hinder hauling and grading; subject to severe boulder heaving, particularly in areas of very cold climate; some slopes over 15 percent.	Some slopes over 15 percent.
Burdett: BuA, BuB, BuC	Fair to good: contain shale fragments in places.	Unsuitable: none present.	Silty surface and upper part of subsoil poor: highly erodible; lower part of subsoil and underlying till; fair to good; seasonally wet.	Seasonal high water table ½ to 1½ feet below surface; cut slopes subject to severe seepage and sloughing; skin cuts and very light fills provide nonuniform subgrade conditions; subgrade in cuts generally good in underlying till; trafficability poor when wet.	Generally adequate strength for moderately high embankments.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally adequate strength; seasonal high water table 1½ to 2 feet below surface.	Moderately slow or slow permeability below depth of 3½ feet; seasonal high water table 1½ to 2 feet below surface; BoC is moderately sloping.	Surface mantle highly erodible if used alone; underlying till stable; slow permeability; some large stones.	Seasonal high water table 1½ to 2 feet below the surface; unstable ditchbanks; moderate to moderately slow permeability to depth of about 3½ feet and moderately slow or slow permeability below.	Moderate to rapid water intake rate; moderate to high available water capacity; seasonal high water table 1½ to 2 feet below surface; root zone is mainly above depth of 2 feet; permeability below surface in this zone is moderate to moderately slow.	Moderate to moderately slow permeability above depth of 3½ feet; surface mantle erodible; siltation problems.	Surface mantle highly erodible; siltation problems; moderately well drained.
Seasonal high water table 1½ to 2½ feet below surface; generally adequate strength; surface mantle compressible; BrD moderately steep.	Slow permeability below depth of 1½ to 3 feet; seasonal high water table 1½ to 2½ feet below surface; BrC and BrD have adverse slopes.	Surface mantle highly erodible if used alone; underlying material stable; slow permeability; some large stones.	Seasonal high water table 1½ to 2½ feet below surface; unstable ditchbanks; slow permeability below depth of 1½ to 3 feet; BrC moderately sloping; BrD moderately steep.	Moderate water intake rate; moderate to high available water capacity; seasonal high water table 1½ to 2½ feet below surface; root zone between depths of 1½ to 3 feet above fragipan.	Slowly permeable fragipan 1½ to 3 feet below surface; surface mantle erodible; siltation problems; BrD has adverse slopes.	Surface mantle highly erodible; siltation problems; well drained to moderately well drained; BrD moderately steep.
Extremely stony; some slopes over 15 percent.	Extremely stony; some slopes over 10 percent.	Extremely stony.	Not suitable for agricultural drainage: extremely stony.	Not suitable for irrigation: extremely stony.	Extremely stony; some slopes over 20 percent.	Extremely stony; some slopes over 15 percent.
Generally adequate strength; silty surface mantle slightly compressible; seasonal high water table ½ to 1½ feet below surface.	Slowly permeable below depth of about 1½ feet; seasonal high water table ½ to 1½ feet below surface; BuC moderately sloping.	Silty surface and upper subsoil highly erodible and subject to piping; underlying till has fair to good stability; slow permeability.	Slow permeability below depth of about 1½ feet; ditchbanks unstable and subject to seepage and sloughing; siltation problems; seasonal high water table ½ to 1½ feet below surface; BuC moderately sloping.	Moderate to slow water intake rate; seasonal high water table ½ to 1½ feet below surface; restricted root zone; moderate available water capacity; BuC moderately sloping.	Silty surface and upper subsoil are highly erodible; slowly permeable below depth of about 1½ feet; seasonal high water table ½ to 1½ feet below surface.	Subject to prolonged flow; silty surface layer and upper part of subsoil highly erodible; somewhat poorly drained; seasonal high water table ½ to 1½ feet below surface.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Canton: CaB, CaC	Poor: stony	Unsuitable: none present.	Good to fair: large boulders in places; highly erodible.	Grade location not critical; cut slopes erodible; boulders lose embedment in places; subgrade in cuts subject to differential frost heaving and boulder heaving.	Generally adequate strength for high embankments.
Carlisle: Cm	Poor: organic soil that can be used to improve physical condition of mineral soil.	Unsuitable	Unsuitable	Prolonged high water table at surface; wet, compressible organic material 51 or more inches thick over mineral soils; suitable drainage outlets very difficult to locate; very poor to no trafficability.	Unsuitable for embankment foundation in natural state; 51 inches or more of organic material must be removed and replaced with suitable underwater backfill.
Cohoctah: Co	Fair: prolonged high water table at or near surface.	Unsuitable	Unsuitable	Prolonged high water table at or near surface; subject to flooding; drainage outlets not generally available.	Highly compressible soils on surface; underlying material variable.
Conesus: CsB	Fair to poor: some gravel.	Unsuitable: none present.	Good: few large stones.	Seasonal high water table 1½ to 2 feet below surface. Cut slopes subject to seepage and sloughing; subgrade in cuts generally good; subject to boulder heaving in places; trafficability generally good.	Generally adequate strength for high embankments.
Cut and fill land: Cu. Material variable: onsite investigation necessary prior to engineering evaluation.					

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally few adverse features; some boulders.	Rapidly permeable below depth of about 2½ feet; CaC moderately sloping.	Stones and some large boulders; permeability variable.	Agricultural drainage not needed; well drained.	Rapid water intake rate; root zone mainly above depth of 2½ feet; moderate available water capacity; stones and some large boulders.	Rapidly permeable in sandy substratum below depth of about 2½ feet; low fertility; stones and some large boulders; erodible.	Rapidly permeable in sandy substratum below depth of about 2½ feet; low fertility; stones and some large boulders; erodible; well drained.
Unsuitable for foundations in natural state; 51 inches or more of wet, compressible organic material.	Prolonged high water table at surface; 51 inches or more of rapidly permeable organic material over variable mineral soil.	Unsuitable for embankments; 51 inches or more of organic material over variable mineral soil.	Prolonged high water table at surface; subject to subsidence and soil blowing; outlets very difficult to locate.	Drainage needed; water level control for subirrigation.	Diversions not needed: flat or depressional; 51 inches or more of organic material over mineral soil.	Not suitable for waterways; flat or depressional; very poorly drained organic material 51 or more inches thick over mineral soil.
Prolonged high water table at or near surface; subject to flooding; variable strength.	Prolonged high water table at or near surface; pervious throughout.	Surface layer high in organic matter; usually wet in natural state; highly erodible; subject to piping.	Subject to flooding; prolonged high water table at or near surface; ditchbanks unstable; drainage outlets generally not available.	Prolonged high water table at or near surface; drainage needed; subject to flooding.	Diversions not needed; nearly level.	Not suitable for waterways; nearly level; poorly and very poorly drained.
Generally adequate strength and low compressibility; seasonal high water table 1½ to 2 feet below surface.	Seasonal high water table 1½ to 2 feet below surface; very slow or slow permeability below depth of about 3 feet.	Good stability; few large stones; slow permeability.	Seasonal high water table 1½ to 2 feet below surface; very slow or slow permeability below depth of about 3 feet.	Moderate water intake rate; high available water capacity; seasonal high water table 1½ to 2 feet below surface.	Generally no adverse features.	Subject to seepage; moderately well drained.

525-444—75——5

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Farmington: FaC, FcD, FkE. In unit FkE, Rock land is part of a complex with Farmington and 25 to 80 percent of areas are exposed bedrock, usually limestone.	Poor: too many coarse fragments.	Unsuitable	Poor: low soil volume; FkE includes nonsoil areas.	Shallow to bedrock (dominantly limestone but sandstone in places); extensive flat areas in FaC and FcD require moderately high gradeline to avoid blasting rock for drainage ditches; rock in cuts; seepage above rock. In unit FkE, alinements parallel to steep rock faces should be bypassed to avoid excessive rock excavation. Trafficability generally good on FaC. FcD has some adversely steep topography, and FkE very adverse.	Adequate strength for high embankments; FkE is steeply sloping; FcD includes areas with slopes greater than 15 percent.
Fredon: Fr	Fair to poor: contains gravel; wet in places.	Generally good in substratum; problems of underwater excavation.	Good: wet in places.	Seasonal high water table ½ to 1½ feet below surface; cuts not indicated unless drainage outlets available. Seepage and sloughing problems in cuts; subgrade in cuts subject to severe differential frost heaving; trafficability seasonally poor.	Generally adequate strength for moderately high embankments.
Fresh water marsh: Fw. Material variable: onsite investigation necessary prior to engineering evaluation.					
Halsey: Ha	Fair to poor: generally wet; too gravelly in places.	Generally good: problems of underwater excavation; shaly in places.	Generally good: problems of underwater excavation.	Prolonged high water table at or near surface; unless drainage outlets available, elevated gradeline is indicated; cut slopes unstable; seepage and sloughing problems; subgrade in cuts subject to severe differential frost heaving; trafficability usually poor.	Generally adequate strength for moderately high embankments.
Hamlin: He; Hf	Good to depth of 3 feet or more: gravelly below; level in places; seasonally wet in lower part of subsoil in places; erodible.	Generally unsuitable.	Poor: silty and fine sandy material; highly erodible.	Seasonal water table 2 to 2½ feet below surface in places for brief periods; subject to flooding; elevated gradeline above high water is indicated; cuts should be avoided.	Generally adequate strength for low embankments; underlying soils soft, wet, weak, and compressible in places.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Adequate strength and negligible compressibility; some sinkhole areas; shallow to bedrock (dominantly limestone but sandstone in places); rock excavations; FkE steeply sloping; FcD includes areas with slopes greater than 15 percent.	Shallow to bedrock.	Shallow to bedrock; low yield of suitable material.	Not suitable for agricultural drainage: well drained; shallow to bedrock.	Moderate water intake rate; root zone limited to depth of 10 to 20 inches above bedrock; low available water capacity; FcD very rocky and includes areas with slopes greater than 10 percent; FkE steep and has large areas of exposed bedrock.	Shallow to bedrock; FcD very rocky and includes areas with slopes greater than 20 percent; FkE steeply sloping and has large areas of exposed bedrock.	Shallow to bedrock; FcD very rocky and includes areas with slopes greater than 15 percent; FkE steeply sloping and has large areas of exposed bedrock.
Generally adequate strength and low compressibility except under vibratory loads; seasonal high water table ½ to 1 ½ feet below surface.	Seasonal high water table ½ to 1½ feet below surface; substratum rapidly permeable.	Pervious material; good for outside shell; wet in places.	Seasonal high water table ½ to 1½ feet below surface; ditchbanks unstable.	Seasonal high water table ½ to 1½ feet below surface; drainage needed; rapid water intake rate; low to moderate available water capacity.	Diversions not needed: nearly level.	Not suitable for waterways: nearly level.
Generally not suitable for foundations: prolonged high water table at or near surface; large settlements possible under heavy or vibratory loads.	Prolonged high water table at or near surface; rapid permeability in substratum.	Pervious material; good for outside shell; wet in places.	Prolonged high water table at or near surface; ditchbanks unstable; outlets difficult to establish in places.	Generally not suitable for irrigation; prolonged high water table at or near surface.	Flat or depressional.	Flat or depressional; prolonged high water table at or near surface; very poorly drained.
Not suitable for foundations: subject to flooding.	Subject to flooding; moderate permeability; water table 2 to 2½ feet below surface in places for brief periods.	Highly erodible; permeability variable; subject to piping; wet below depth of 2 to 2½ feet in places for brief periods.	Subject to flooding but drainage not generally needed; water table 2 to 2½ feet below surface in places for brief periods.	Moderate water intake rate; root zone unrestricted; high available water capacity; subject to flooding but rarely during growing season.	Diversions not needed: nearly level.	Not suitable for waterways: nearly level.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Hartland: HgB, HgC, HgD. Mapped only in a complex with Agawam soils. Interpretative information applies to both Hartland and Agawam soils in these units.	Good: erodible; subject to soil blowing.	Variable: sand under Agawam in some places.	Variable from place to place. Sandy deposits under Agawam good. Silty material in Hartland poor: erodible; subject to soil blowing; positive drainage control necessary.	Gradeline not critical above water table, which is normally several feet below surface but within 2½ feet in places; exceptions is where soils are underlain by silty and clayey bottom sediment; cut slopes highly erodible and subject to soil blowing; slope protection blanket necessary in places; subgrade in cuts subject to severe differential frost heaving; HgD moderately steep; trafficability generally poor.	Variable soil strength; generally adequate strength for low embankments; HgD moderately steep.
Herkimer: HhA, HhB, HkB.	Poor: too gravelly and shaly.	Good to fair: high shale content.	Good	Highway grade location not critical above water table, which is below depth of 3½ feet in HhA and HhB, but within 1½ feet of surface in HkB in places; cut slopes subject to seepage; subgrade in cuts subject to severe differential frost heaving; trafficability generally good.	Generally adequate strength for moderately high to high embankments.
Hilton: HlB, HlC	Poor: too gravelly.	Unsuitable: none present.	Good: some large stones.	Seasonal high water table 1½ to 2 feet below surface; cut slopes subject to seepage and sloughing in places; subgrade in cuts generally good; trafficability generally good.	Generally adequate strength for high embankments.
*Hinckley: HmA, HmB, HmC, HnD, HnF. For interpretations other than those affected by slope, see Windsor series for Windsor part of HnD and HnF.	Poor: too gravelly and droughty.	Good	Good	Highway grade location not critical above water table, which is normally several feet below surface but locally encountered as close as 3½ feet below surface in places; cut slopes erodible; subgrade in cuts subject to differential frost heaving; HnD moderately steep; HnF steep; trafficability generally good on HmB and HmC, poor on HnD and HnF.	Generally adequate strength for moderately high embankments; HnD moderately steep; HnF steep.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued							
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally adequate strength; compressible under vibratory loads; HgD moderately steep.	Permeability ranges from moderate in Hartland to rapid in substratum of Agawam.	Poor stability; erodible; susceptible to piping; moderate permeability.	Agricultural drainage not needed: well drained.	Moderate to rapid water intake rate; root zone unrestricted; high available water capacity; HgC moderately sloping; HgD moderately steep; highly erodible; susceptible to soil blowing.	Complex short slopes; highly erodible; susceptible to soil blowing; moderate to rapid permeability; HgD moderately steep.	Complex short slopes; highly erodible; susceptible to soil blowing; siltation problems; low fertility; well drained; HgD moderately steep.
Generally moderately high to high strength; low compressibility except under vibratory loads; seasonal high water table 1½ to 3½ feet below surface in HkB.	Moderate to rapid permeability; seasonal high water table 1½ to 3½ feet below surface in HkB.	Good stability; generally moderately slow or slow permeability.	Agricultural drainage not needed on HhA and HhB, which are well drained; seasonal high water table 1½ to 3½ feet below surface in HkB; cut slopes subject to seepage; moderate to rapid permeability.	Moderate to rapid water intake rate; root zone generally unrestricted; moderate available water capacity.	Moderate to rapid permeability; subject to seepage.	Moderate to rapid permeability; subject to seepage; fair stability; well drained to moderately well drained.
Adequate strength; low compressibility; seasonal high water table 1½ to 2 feet below surface.	Permeability slow in substratum; seasonal high water table 1½ to 2 feet below surface; HlC moderately sloping.	Good stability; slow permeability; some large stones.	Seasonal high water table 1½ to 2 feet below surface; slow permeability in substratum; HlC moderately sloping.	Moderate water intake rate; root zone mainly in top 24 inches; moderate available water capacity; HlC moderately sloping.	Generally few adverse features: some large stones.	Generally few adverse features: some large stones; moderately well drained.
Moderately high strength; compressible under vibratory loads; HnD moderately steep; HnF steep.	Rapidly permeable throughout.	Fair to good stability; pervious material; good for outside shell.	Agricultural drainage not needed: excessively drained.	Rapid water intake rate; root zone mainly in top 30 inches; low or very low available water capacity; HmC moderately sloping; HnD moderately steep; HnF steep.	Rapidly permeable sand and gravel; HnD moderately steep; HnF steep.	Rapidly permeable sand and gravel; droughty; low fertility; erodible; excessively drained; HnD moderately steep; HnF steep.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of— Topsoil	Sand and gravel	Fill material	Soil features affecting— Highway location	Embankment foundation [1]
*Honeoye: HoB, HoC, HoD, HrE, HsD. For interpretations other than those affected by slope, see Lansing series for Lansing part of HrE. For interpretations other than those affected by stoniness, see Mohawk series for Mohawk part of HsD.	Poor: HsD too gravelly or too stony.	Unsuitable	Good: some large stones; HsD very stony.	Highway grade location not generally critical, except for problems of daylighting cuts on HoD and HrE, which are moderately steep and steep; cut slopes generally good but some local seepage and sloughing in places; subgrade in cuts generally good but some local seepage in places; HoD moderately steep; HrE steep; trafficability generally good on HoB and HoC and poor on HoD and HrE. Stones hinder hauling and grading on HsD.	Generally adequate strength for high embankments; HoD moderately steep; HrE steep.
Hornell: HtA, HtB, HtC	Poor to fair: some shale fragments; high clay content in places.	Unsuitable	Poor: clayey; low shear strength; 20 to 40 inches thick over shale bedrock.	Seasonal high water table ½ to 2 feet below surface. Highway grade location generally not critical; shale bedrock in cuts 20 to 40 inches below surface; unstable clay and silt in cuts; subject to seepage.	Adequate strength for high embankments.
*Howard: HuA, HuB, HuC, HvA, HvB, HvC, HwD. Interpretive information applies to both Howard and Palmyra soils in HwD.	Poor: too gravelly.	Good: cemented in places.	Good: water needed for proper compaction.	Highway grade location generally not critical above water table, which is normally several feet below surface; locally it is within 3½ feet of surface in places, local seepage and sloughing in cuts; cobblesize fragments lose embedment in places; subgrade in cuts subject to differential frost heaving; HwD moderately steep and complex short slopes common; trafficability generally good except on HwD.	Generally adequate strength for moderately high to high embankments; HwD moderately steep.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Adequate strength and low compressibility; HoD moderately steep; HrE steep; HsD includes slopes of more than 15 percent.	Slow permeability in substratum; HoC moderately sloping; HoD moderately steep; HrE steep; HsD includes slopes of more than 10 percent.	Good stability; slow permeability; some large stones; HsD very stony.	Agricultural drainage not needed: well drained.	Moderate water intake rate; root zone mainly in top 20 to 30 inches; moderate to high available water capacity; HoC moderately sloping; HoD moderately steep; HrE steep; HsD very stony.	Slow permeability in substratum; HoD moderately steep; HrE steep; HsD very stony and includes some adverse slopes.	Slow permeability in substratum; HoD moderately steep; HrE steep; HsD very stony and includes some adverse slopes; well drained.
Adequate strength; seasonal high water table ½ to 1½ feet below surface; shale bedrock in excavation 20 to 40 inches below surface.	Shale bedrock 20 to 40 inches below surface; HtC moderately sloping.	Fair to poor stability; slow permeability; poor workability when wet, low yield of suitable material; shale bedrock at depth of 1½ to 3½ feet.	Seasonal high water table ½ to 2 feet below surface; shale bedrock 20 to 40 inches below surface; slowly permeable; HtC moderately sloping.	Slow water intake rate; root zone limited; moderate available water capacity; drainage needed; HtC moderately sloping.	Shale bedrock 20 to 40 inches below surface.	Subject to seepage and prolonged flow; shale bedrock 20 to 40 inches below surface; somewhat poorly drained to moderately well drained.
Generally adequate strength; susceptible to settlement under vibratory loads; HwD moderately steep.	Pervious material; excess seepage.	Good stability for outside shell; moderately rapid to rapid permeability.	Agricultural drainage not needed: well drained to somewhat excessively drained.	Moderate to rapid water intake rate; root zone unrestricted; low to moderate available water capacity; HuC and HvC moderately sloping; HwD moderately steep.	Pervious material; high gravel content; difficult to vegetate; HwD moderately steep and has common, irregular, short slopes.	Pervious material; high gravel content; difficult to vegetate; HwD moderately steep and has common, irregular, short slopes; well drained to somewhat excessively drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Hudson: HyB, HyC, HyD	Fair to poor depending on clay content.	Surficial clayey deposit unsuitable. Good in places where underlain by gravelly outwash below depth of 40 to 60 inches.	Surficial clayey deposit poor; erodible; low shear strength. Substratum of till or outwash below depth of 40 to 60 inches generally good.	Seasonal high water table 1½ to 2½ feet below surface; moderately deep cuts expose soils with contrasting texture; or bedrock in places; seepage and sloughing problems in cuts; subgrade in clayey surficial material in cuts presents trafficability problems; subgrade in substratum of gravelly outwash subject to differential frost heaving; boulder heaving a problem in till; trafficability generally poor when wet; HyD moderately steep.	Variable strength; HyD moderately steep.
*Ilion: In, Is. Except for very stony feature, see Sun series for Sun part of unit Is.	Poor: wet; unit Is is very stony.	Unsuitable	Poor: wet for long periods; high in clay; unit Is is very stony.	Prolonged high water table at or near surface; locate highway grades moderately high unless drainage outlets available; wet, unstable soils in cuts; wet subgrade in cuts; poor trafficability; stones in Is hinder hauling and grading.	Surface high in organic matter, otherwise generally adequate strength for moderately high embankments.
Lairdsville, loamy subsoil variant: LaB, LaC, LaD.	Poor: high shale content.	Unsuitable	Poor: shale bedrock 20 to 40 inches below surface.	Seasonal high water table 1½ to 2½ feet below surface; shale bedrock 20 to 40 inches below surface; rock in cuts; seepage above rock; frost problems; trafficability good to fair on LaB and LaC and poor on LaD, which is moderately steep; all soils seasonally wet.	Generally adequate strength for high embankments; LaD moderately steep.
Lamson: Lk	Good but usually wet.	Unsuitable	Fair: usually wet; surface layer high in organic matter; highly erodible.	Prolonged high water table at or near surface; flat or depressional; drainage outlets not generally available; cuts not indicated; cut slopes wet and unstable; subgrade in cuts consists of wet, unstable sand and silt; subject to severe differential frost heaving; trafficability blanket necessary.	Generally adequate strength for low embankments; underlain by wet, soft, compressible soils in places.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally adequate strength; compressible clayey surficial deposit; seasonal high water table 1½ to 2½ feet below surface; HyD moderately steep.	Slow permeability of clayey surficial deposit; slow to rapid permeability in substratum between depths of 40 and 60 inches, depending on whether it is dense till or gravelly outwash; bedrock between depths of 40 and 60 inches in places; HyC and HyD have adverse slopes.	Clayey surficial deposit has poor stability and workability; slow permeability for inside core; some stones in substratum where till is stable and slowly permeable; pervious and suitable for outside shell in substratum where gravelly outwash is stable.	Slow permeability in clayey surficial deposit; seasonal high water table 1½ to 2½ feet below surface; ditchbanks unstable; HyC and HyD have adverse slopes.	Slow water intake rate; root zone mainly in top 2 feet; moderate to high available water capacity; HyC and HyD have adverse slopes.	Poor workability when wet; slow permeability in clayey surficial deposit; HyD has adverse slopes	Clayey subsoil; seepy areas; moderately well drained; HyD has adverse slopes.
Generally not suitable for foundations: prolonged high water table at or near surface.	Moderately slow or slow permeability below depth of about 9 inches; prolonged high water table at or near surface; depressional in places.	Fair to poor stability; slow permeability; usually wet and difficult to work; unit is very stony.	Prolonged high water table at or near surface; cut slopes unstable; slow internal water movement; depressional in places; unit is very stony.	Irrigation generally not needed: prolonged high water table at or near surface.	Flat or depressional.	Flat or depressional; subject to prolonged flow; cut slopes unstable; drainage poor or very poor; unit is very stony.
Generally adequate strength; negligible compressibility; seasonal high water table 1½ to 2½ feet below surface; shale bedrock in excavations 20 to 40 inches below surface; LaD moderately steep.	Shale bedrock 20 to 40 inches below surface; LaC and LaD have adverse slopes.	Stability of material above bedrock fair to good; slow permeability; shale bedrock 20 to 40 inches below surface; low yield.	Seasonal high water table 1½ to 2½ feet below surface; moderately slow or slow permeability in subsoil; shale bedrock 20 to 40 inches below surface; LaC and LaD have adverse slopes.	Moderate to slow water intake rate; root zone mainly in top 20 to 30 inches; moderate available water capacity; seasonal high water table 1½ to 2½ feet below surface; LaC and LaD have adverse slopes.	Shale bedrock 20 to 40 inches below surface; LaD has adverse slopes.	Shale bedrock 20 to 40 inches below surface; subject to seepage; moderately well drained to well drained; LaD has adverse slopes.
Generally not suitable for foundations: prolonged high water table at or near surface; generally unstable; large settlements possible.	Prolonged high water table at or near surface; pervious material.	Poor stability; highly erodible; susceptible to piping; generally wet.	Cut slopes very unstable; susceptible to piping; prolonged high water table at or near surface; natural outlets generally not available.	Irrigation generally not needed: prolonged high water table at or near surface.	Flat or depressional.	Flat or depressional; poorly and very poorly drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Lansing: LnC, LnD	Poor to fair: gravel.	Unsuitable	Good: some large stones.	Highway grade location generally not critical; bedrock in some deep cuts; local seepage and sloughing problems in cuts; subgrade in cuts generally good; subject to boulder heaving in some areas; trafficability good to fair; LnD moderately steep.	Generally adequate strength for high embankments; LnD moderately steep.
Lima: LoA, LoB, LoC	Fair to poor: gravel.	Unsuitable	Good: some large stones.	Seasonal high water table 1½ to 2 feet below surface; highway grade location generally not critical but rock encountered in some deep cuts; cut slopes subject to seepage and sloughing; subgrade in cuts into substratum generally good: subject to boulder heaving in some areas; trafficability generally good.	Generally adequate strength for high embankments.
Lockport, loamy subsoil variant: LpB.	Fair to poor: high clay content.	Unsuitable	Poor: shale bedrock 20 to 40 inches below surface; high clay content.	Seasonal high water table ½ to 1½ feet below surface; shale bedrock 20 to 40 inches below surface; rock in cuts; seepage problems; frost problems; trafficability good to fair; seasonally wet.	Generally adequate strength for high embankments.
Lyons: Ly	Poor: wet; gravel.	Unsuitable	Poor: wet	Prolonged high water table at or near surface; elevated gradeline needed unless areas drainable; cut slopes wet and unstable; wet subgrade in cuts; poor trafficability.	Generally adequate strength for moderately high embankments; surface layer high in organic-matter content.
Manheim: McA, McB, McC.	Poor: shale and gravel.	Unsuitable	Good: seasonally wet.	Seasonal high water table ½ to 1½ feet below surface; grade location generally not critical, but McA nearly level and fairly extensive; cut slopes subject to seepage and sloughing; subgrades in cuts wet for long periods in places; deep cuts expose bedrock in places; trafficability poor when wet.	Generally adequate strength for high embankments.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Adequate strength; low compressibility; LnD moderately steep.	Adverse slopes; slow or very slow permeability in substratum about 42 inches below surface.	Good stability and shear strength; slow permeability; some large stones.	Agricultural drainage generally not needed: well drained.	Moderate water intake rate; root zone mainly in top 30 inches; high available water capacity; both units have adverse slopes.	LnC generally has no adverse features; LnD has adverse slopes.	Erodible on steeper slopes; well drained.
Adequate strength; negligible compressibility; seasonal high water table 1½ to 2 feet below surface.	Slow permeability in substratum about 31 inches below surface; seasonal high water table 1½ to 2 feet below surface; LoC has adverse slopes.	Good stability and shear strength; slow permeability; some large stones.	Seasonal high water table 1½ to 2 feet below surface; slow permeability in substratum about 31 inches below surface; LoC has adverse slopes.	Moderate water intake rate; root zone mainly in top 24 inches; moderate available water capacity; LoC has adverse slopes.	Generally no adverse features.	Generally few adverse features; moderately well drained.
Adequate strength; negligible compressibility; seasonal high water table ½ to 1½ feet below surface; shale bedrock in excavations 20 to 40 inches below surface.	Shale bedrock 20 to 40 inches below surface.	Fair to poor stability; slow permeability; poor workability when wet; shale bedrock 20 to 40 inches below surface; low yield.	Seasonal high water table ½ to 1½ feet below surface; shale bedrock 20 to 40 inches below surface; moderately slow or slow permeability.	Low water intake rate; root zone limited; low to moderate available water capacity; seasonal high water table ½ to 1½ feet below surface.	Shale bedrock 20 to 40 inches below surface.	Subject to seepage and prolonged flow; shale bedrock 20 to 40 inches below surface; somewhat poorly drained.
Generally not suitable for foundations: prolonged high water table at or near surface; surface layer compressible.	Prolonged high water table at or near surface; slow or very slow permeability in substratum below depth of about 2 feet; flat or depressional.	Silty surface soil and subsoil have poor stability and are highly erodible. Substratum generally has good stability and slow permeability; generally wet; some large stones.	Prolonged high water table at or near surface; ditchbanks unstable; slow or very slow permeability below depth of about 24 inches; outlets difficult to establish in places.	Irrigation generally not needed: prolonged high water table at or near surface.	Flat or depressional.	Flat or depressional; ditchbanks unstable; subject to prolonged flow; poorly drained and very poorly drained.
Adequate strength; negligible compressibility; seasonal high water table ½ to 1½ feet below surface.	Seasonal high water table ½ to 1½ feet below surface; slow permeability in substratum below depth of about 28 inches.	Fair to good stability; slow permeability; seasonally wet.	Seasonal high water table ½ to 1½ feet below surface; slow permeability in substratum below depth of about 28 inches; ditchbanks unstable in places.	Moderate water intake rate; root zone mainly in top 20 inches; moderate to high available water capacity; seasonal high water table ½ to 1½ feet below surface.	Generally no adverse features.	Erodible; subject to prolonged flow; ditchbanks unstable in places; somewhat poorly drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Manlius: MlB, MlC, MlD	Poor: high shale content.	Unsuitable	Good but low yield: shale bedrock 20 to 40 inches below surface.	Shale bedrock 20 to 40 inches below surface; problems of daylighting cut slopes on alignments parallel to slopes on MlD, otherwise grade location not critical; rock in most cuts; subgrade in cuts usually in rock; seepage and frost heaving problems above rock; trafficability poor on MlD, which is moderately steep, and good to fair otherwise.	Adequate strength for high embankments; need shear keys on MlD in places.
Massena: MnB	Fair to poor: some gravel; wet in places.	Unsuitable	Good to fair: wet in places; some large stones.	High water table less than 1 foot below surface for fairly long periods; skin cuts and light fills along gradeline should be avoided; cut slopes subject to seepage and sloughing; subgrade in cuts often wet; subject to boulder heaving in places; trafficability poor when wet.	Generally adequate strength for high embankments.
Mohawk, shale substratum: MoB, MoC, MoD	Poor to fair: shale chips; stones in places.	Unsuitable	Good but underlain by shale bedrock 3½ to 5 feet below surface; limited yield.	Seasonal high water table 2 to 2½ feet below surface; cut slopes subject to seepage and sloughing; bedrock in cuts below depth of 3½ to 5 feet; trafficability poor on MoD, which is moderately steep, otherwise good to fair.	Adequate strength for high embankments; need shear keys on MoD in places.
Mosherville: MsB	Fair: some gravel.	Unsuitable	Surface veneer 12 to 36 inches thick of silt and very fine sand is poor: highly erodible. Underlying material generally good: many boulders in places; wet in places.	Seasonal high water table ½ to 1½ feet below surface; skin cuts and very light fills provide nonuniform soil and subgrade conditions; cuts subject to seepage and sloughing above fragipan, 14 to 30 inches below surface; subgrade in cuts in 12- to 36-inch veneer subject to differential frost heaving; subgrade in cuts in underlying material subject to boulder heaving; trafficability seasonally poor.	Generally adequate strength for high embankments.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Adequate strength; low compressibility; shale bedrock in excavations below depth of 20 to 40 inches; MlD moderately steep.	Shale bedrock 20 to 40 inches below surface; MlC and MlD have adverse slopes.	High shale content; variable stability; shale bedrock 20 to 40 inches below surface; low yield.	Agricultural drainage not needed: well drained to excessively drained.	Moderate water intake rate; root zone mainly in top 20 to 30 inches, limited by shale bedrock; low to moderate available water capacity; MlC and MlD have adverse slopes.	Shale bedrock 20 to 40 inches below surface; MlD too steep.	Shale bedrock 20 to 40 inches below surface; well drained to excessively drained; MlD moderately steep.
Adequate strength; low to moderate compressibility; water table less than 1 foot below surface for fairly long periods.	Water table less than 1 foot below surface for fairly long periods; slow permeability in substratum below depth of about 36 inches.	Good stability; slow permeability; wet in places; some large stones.	Water table less than 1 foot below surface for fairly long periods; ditchbanks unstable; slow permeability in substratum below depth of about 3 feet.	Somewhat poorly drained to poorly drained; drainage needed; moderate water intake rate; root zone limited; available water capacity moderate to low unless drained.	Subject to prolonged flow.	Subject to prolonged flow; ditchbanks unstable; somewhat poorly drained to poorly drained.
Adequate strength; low compressibility; seasonal high water table 2 to 2½ feet below surface; shale bedrock in excavations below depth of 3½ to 5 feet; MoD moderately steep.	Shale bedrock 3½ to 5 feet below surface; seasonal high water table 2 to 2½ feet below surface; slow permeability in substratum below depth of about 3 feet; MoC and MoD have adverse slopes.	Good stability; slow permeability; limited yield; shale bedrock 3½ to 5 feet below surface.	Seasonal high water table 2 to 2½ feet below surface; slow permeability in substratum below depth of about 3 feet; MoC and MoD have adverse slopes.	Moderate water intake rate; root zone is 24 inches or more deep; high available water capacity; MoC and MoD have adverse slopes.	Shale bedrock 3½ to 5 feet below surface; MoD too steep.	Shale bedrock 3½ to 5 feet below surface; erodible on steeper slopes; well drained to moderately well drained; MoD moderately steep.
Surface veneer 12 to 36 inches thick subject to compaction and settlement. Underlying material has adequate strength; seasonal high water table ½ to 1½ feet below surface.	Seasonal high water table ½ to 1½ feet below surface; slow permeability in fragipan and underlying till below depths of 14 to 30 inches.	Surface veneer 12 to 36 inches thick unstable and highly erodible. Underlying material stable; slow permeability; some large stones; wet in places.	Seasonal high water table ½ to 1½ feet below surface; slow permeability in fragipan 14 to 30 inches below surface; ditchbanks unstable; siltation problems.	Moderate water intake rate; root zone mainly in top 15 to 20 inches; moderate available water capacity; seasonal high water table ½ to 1½ feet below surface.	Surface veneer 12 to 36 inches thick is highly erodible. Slow permeability in fragipan 14 to 30 inches below surface.	Subject to seepage; unstable ditchbanks; siltation problems; somewhat poorly drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Nassau: NaB, NaC, NaD	Poor: too shaly	Unsuitable	Poor: shale bedrock 8 to 20 inches below surface; very low yield.	Shale bedrock 8 to 20 inches below surface; problems of daylighting cut slopes on alinements parallel to slopes on NaD, otherwise grade location not critical; rock in cuts and subgrade in cuts; seepage and frost problems above rock; trafficability poor, especially on NaD, which is moderately steep.	Adequate strength for high embankments; need shear keys on NaD in places.
Ontario: OnB, OnC, OnD	Poor: gravel	Unsuitable	Good: some large stones.	Grade location not generally critical; bedrock in some deep cuts; cut slopes subject to local seepage and sloughing; subgrade in cuts generally good; trafficability poor on OnD, which is moderately steep, otherwise generally good.	Generally adequate strength for high embankments.
Palatine: PaB, PaC, PaD	Poor: too shaly	Unsuitable	Good but low yield of suitable material; shale bedrock 1½ to 3½ feet below surface.	Problems of daylighting cuts in PaD, otherwise grade location not critical; rock in most cuts; seepage, sloughing, and frost problems above rock; trafficability generally good except on PaD, which is moderately steep.	Generally adequate strength for high embankments; need shear keys on PaD in places.
Palms: Pk	Possible use as amendment for mineral soils; many roots in wooded areas.	Unsuitable	Unsuitable	Prolonged high water table at or near surface; wet, compressible organic soil 16 to 50 inches thick over mineral soil; trafficability very poor.	Unsuitable in natural state; 16 to 50 inches of organic material should be removed and replaced with suitable underwater backfill.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Adequate strength; low compressibility; shale bedrock in excavations 8 to 20 inches below surface; NaD moderately steep.	Shale bedrock 8 to 20 inches below surface.	Shale bedrock 8 to 20 inches below surface; very low yield of suitable material; high shale content.	Agricultural drainage not needed: somewhat excessively drained.	Moderate water intake rate; root zone at depth of 8 to 20 inches above bedrock; low to very low available water capacity; NaC and NaD have adverse slopes.	Shale bedrock 8 to 20 inches below surface.	Shale bedrock 8 to 20 inches below surface; somewhat excessively drained.
Adequate strength; low compressibility; OnD moderately steep.	Very slow or slow permeability in substratum below depth of about 31 inches; OnC and OnD have adverse slopes.	Good stability; slow permeability; some large stones.	Agricultural drainage generally not needed: well drained.	Moderate water intake rate; root zone mainly in top 30 inches; moderate available water capacity; OnC and OnD have adverse slopes.	Generally no adverse features in OnB and OnC; OnD has adverse slopes.	Erodible on steeper slopes; well drained.
Adequate strength; low compressibility; shale bedrock in excavations below depth of 1½ to 3½ feet; PaD moderately steep.	Shale bedrock 1½ to 3½ feet below surface.	Fair to good stability; slow permeability; low yield; shale bedrock 1½ to 3½ feet below surface.	Agricultural drainage generally not needed: well drained to somewhat excessively drained.	Moderate water intake rate; root zone 1½ to 3½ feet above shale bedrock; moderate available water capacity; PaC and PaD have adverse slopes.	Shale bedrock 1½ to 3½ feet below surface; PaD has adverse slopes.	Shale bedrock 1½ to 3½ feet below surface; erodible; well drained to somewhat excessively drained.
Not suitable for foundations; 16 to 50 inches of wet organic soil over mineral soil.	Prolonged high water table at or near surface; 16 to 50 inches of organic soil over mineral soil of variable permeability.	Poorly suited to embankments; 16 to 50 inches of wet organic soil over variable mineral soil.	Agricultural drainage generally not needed: prolonged high water table at or near surface; 16 to 50 inches of organic soil over mineral soil; high shrinkage when drained.	Irrigation generally not needed: prolonged high water table at or near surface.	Flat or depressional.	Flat or depressional; 16 to 50 inches of organic soil over mineral soil; very poorly drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	**Sand and gravel**	Fill material	Highway location	Embankment foundation [1]
***Palmyra:** PlA, PlB, PlC, PmC, PmF. Interpretive information applies to both Palmyra and Howard soils in PmC and PmF.	Poor: too gravelly.	Good: cemented in places.	Good: water needed for compaction.	Problems of daylighting cut slopes in PmF, otherwise grade location not critical except as influenced by water table, which is rarely within 3½ feet of surface; local seepage and sloughing problems in deep cuts in places; cobblestones lose embedment in cuts in places: subgrade in cuts is stratified material, subject to very severe differential frost heaving; trafficability good to fair except on PmF, which is steep or very steep.	Generally adequate strength for moderately high to high embankments; PmF steep or very steep and areas are difficult for construction operations.
Phelps: PpB	Poor: too gravelly.	Generally good: cemented in places; wet in places.	Good: wet in places.	Seasonal high water table 1½ to 2 feet below surface; grade location not critical above water table; seepage and sloughing problems in cuts; subgrade in cuts subject to severe differential frost heaving; trafficability generally good but poor when wet.	Generally adequate strength for moderately high to high embankments.
Raynham: RaB	Good: erodible; wet in places.	Unsuitable	Poor: silt and very fine sand; highly erodible; wet in places.	Seasonal high water table ½ to 1½ feet below surface for fairly long periods; grade should be moderately high on extensive flat areas; wet and unstable in cuts; subgrade in cuts wet in places and subject to differential frost heaving; trafficability blanket needed in places; trafficability poor when wet.	Generally adequate strength for low embankments; compressible.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally adequate strength; subject to settlement under vibratory loads; PmF has adverse slopes.	Pervious material; excess seepage.	Good stability for outside shell; moderately rapid to rapid permeability.	Agricultural drainage not needed; well drained to excessively drained.	Moderate to rapid water intake rate; root zone unrestricted; low to moderate available water capacity: PlC, PmC, and PmF have adverse slopes.	Pervious material; high gravel content; difficult to vegetate; PmC and PmF have adverse slopes.	Pervious material; high gravel content; difficult to vegetate; well drained to excessively drained; PmC has complex short slopes; PmF steep or very steep.
Generally adequate strength; subject to settlement under vibratory loads; seasonal high water table 1½ to 2 feet below surface.	Pervious material; excess seepage.	Good stability; variable permeability; generally good for outside shell.	Seasonal high water table 1½ to 2 feet below surface; ditchbanks unstable; pervious material.	Moderate to rapid water intake rate; root zone mainly in top 20 inches, available water capacity of this zone low; seasonal high water table 1½ to 2 feet below surface.	Pervious material.	Pervious material; erodible; moderately well drained.
Generally adequate strength; compressible; seasonal high water table ½ to 1½ feet below surface for fairly long periods.	Seasonal high water table ½ to 1½ feet below surface; sandy layers in substratum in places subject to excess seepage in absence of water table.	Poor stability; highly erodible; subject to piping; wet in places.	Seasonal high water table ½ to 1½ feet below surface for fairly long periods; ditchbanks unstable; siltation problems; susceptible to piping.	Irrigation generally not needed: poorly drained to somewhat poorly drained.	Nearly level to very gently sloping; highly erodible; siltation problems; susceptible to piping.	Highly erodible; ditchbanks unstable; siltation problems; poorly drained to somewhat poorly drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Rhinebeck, loamy substratum: RbA, RbB.	Fair to poor, depending on clay content.	Surficial clayey deposit unsuitable. Good in places where underlain by gravelly outwash, below depth of 40 to 60 inches.	Surficial clayey deposit poor: erodible; low shear strength. Substratum of till or outwash, below depth of 40 to 60 inches, generally good; wet in places.	Seasonal high water table ½ to 1½ feet below surface; cuts below depth of 40 to 60 inches expose soils with contrasting texture or bedrock; severe seepage and sloughing in cuts; slope protection blanket needed in places; subgrade in clayey surficial material requires trafficability blanket in places; subgrade in substratum of gravelly outwash subject to differential frost heaving and in till to boulder heaving; trafficability poor when wet.	Variable strength.
Rough broken land: Ro. Material variable. Onsite investigation necessary prior to engineering evaluation.					
Sandstone rock land: Sa. Material variable. Onsite investigation necessary prior to engineering evaluation.					
Shaly rock land: ShF. Material variable. Onsite investigations necessary prior to engineering evaluation.					
Sun: Sm	Fair to poor: some gravel; wet for long periods.	Unsuitable	Poor: wet for long periods.	Prolonged high water table at or near surface; elevated gradeline needed unless areas drainable; drainage outlets generally not available; cut slopes subject to excess seepage and sloughing; subgrade in cuts generally wet; trafficability poor.	Generally adequate strength for moderately high embankments; high organic-matter content in surface layer.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally adequate strength; compressible; clayey surficial material; seasonal high water table ½ to 1½ feet below surface.	Permeability of clayey surficial deposit slow but ranges from slow to rapid in places in substratum between depths of 40 and 60 inches, depending on whether dense till or gravelly outwash; bedrock between depths of 40 to 60 inches in places.	Clayey surficial deposit has poor stability and workability; slow permeability for inside core. Till substratum stable and has slow permeability; outwash substratum stable and pervious, suitable for outside shell.	Seasonal high water table ½ to 1½ feet below surface; slow permeability in clayey surficial deposit; ditchbanks unstable.	Slow water intake rate; root zone mainly in top 10 to 15 inches; available water capacity of root zone moderate; drainage needed.	Poor workability when wet; slow permeability in clayey surficial deposit; subject to prolonged flow.	Clayey subsoil; subject to prolonged flow; somewhat poorly drained.
Generally not suitable for foundations: prolonged high water table at or near surface; surface layer compressible. Subsurface material generally has adequate strength; low compressibility.	Prolonged high water table at or near surface; slow permeability in substratum below depth of about 32 inches.	Surface layer and subsoil, in places unstable; highly erodible; susceptible to piping. Substratum material stable; slow permeability; wet in places; some large stones.	Prolonged high water table at or near surface; slow permeability in substratum below depth of about 32 inches; ditchbanks unstable.	Irrigation generally not needed: prolonged high water table at or near surface.	Flat or depressional.	Flat or depressional; ditchbanks unstable; subfect to prolonged flow; very poorly drained to poorly drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Teel: Te, Ts	Good generally to depths of 40 inches or more; seasonally wet 1 to 2 feet below surface.	Unsuitable	Poor: silty and fine sandy sediment; highly erodible; wet in places.	Seasonal high water table 1 to 2 feet below surface for extended periods; subject to flooding; elevated gradeline above high water elevation needed; cuts should not be made; cut slopes unstable; subgrade in cuts generally wet; soft, unstable soils.	Variable strength.
Wassaic: WaA, WaB, WaC, WaD.	Fair to poor: some gravel.	Unsuitable	Poor: limestone bedrock 1½ to 3½ feet below surface.	Grade location generally not critical but limestone bedrock 1½ to 3½ feet below surface; moderately high gradeline on extensive flat areas of WaA eliminates need for blasting drainage ditches; bedrock in most cuts; seepage and sloughing problems at soil-rock contact; good to fair trafficability except on WaD, which is moderately steep.	Generally adequate strength for high embankments; in places need shear keys on WaD, which is moderately steep.
Wayland: Wd	Good but usually wet.	Unsuitable	Poor: wet silty alluvium; highly erodible.	Subject to flooding; prolonged high water table less than 1 foot below surface; drainage outlets generally not available; elevated gradeline above high water level needed; cuts should be avoided; unstable cut slopes and generally wet subgrades; poor trafficability.	Variable strength.
Williamson: WlA, WlB	Good	Unsuitable	Fair to poor: silt and very fine sand; highly erodible; subject to soil blowing; positive drainage control needed.	Seasonal high water table 1½ to 2 feet below surface; grade needs to be established above water table; cut slopes have severe seepage and slope stability problems; slope protection blanket generally needed; subgrade in cuts seasonally wet; subject to differential frost heaving; trafficability seasonally poor.	Generally adequate strength for low embankments.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally not suitable for foundations: high water table 1 to 2 feet below surface for extended periods; subject to flooding.	Subject to flooding; seasonal high water table 1 to 2 feet below surface for extended periods; moderate permeability.	Poor stability; highly erodible; susceptible to piping; wet in places.	Seasonal high water table 1 to 2 feet below surface for extended periods; moderate permeability; ditchbanks unstable; siltation problems; subject to flooding.	Moderate water intake rate; root zone is mainly in top 20 inches; high available water capacity; seasonal high water table 1 to 2 feet below surface for extended periods; subject to flooding.	Nearly level on flood plains.	Nearly level on flood plains; moderately well drained to somewhat poorly drained.
Adequate strength; limestone bedrock in excavations 1½ to 3½ feet below surface; WaD moderately steep.	Limestone bedrock 1½ to 3½ feet below surface; moderate permeability.	Limestone bedrock 1½ to 3½ feet below surface; limited volume of material; some large stones.	Agricultural drainage generally not needed: well drained.	Moderate water intake rate; root zone mainly in top 1½ to 3½ feet above bedrock; moderate available water capacity; WaC and WaD have adverse slopes.	Limestone bedrock 1½ to 3½ feet below surface; WaD too steep.	Limestone bedrock 1½ to 3½ feet below surface; well drained: WaD moderately steep.
Not suitable for foundations: subject to flooding; prolonged high water table less than 1 foot below surface.	Subject to flooding; prolonged high water table less than 1 foot below surface; variable permeability.	Silty material usually wet; unstable; highly erodible; susceptible to piping.	Subject to flooding; prolonged high water table less than 1 foot below surface; ditchbanks unstable; outlets difficult to establish.	Irrigation generally not needed; poorly drained and very poorly drained.	Nearly level on low flood plain areas.	Nearly level on low flood plain areas; unstable ditchbanks; poorly drained and very poorly drained.
Generally adequate strength; large settlements possible under vibratory loads; seasonal high water table 1½ to 2 feet below surface.	Seasonal high water table 1½ to 2 feet below surface; slow permeability in fragipan below depth of about 27 inches; sand lenses subject to excess seepage during dry periods in substratum in places.	Silty and very fine sandy material; fair to poor stability; highly erodible; wet in places; susceptible to piping.	Seasonal high water table 1½ to 2 feet below surface; slow permeability in fragipan below depth of about 27 inches; ditchbanks unstable; siltation problems; susceptible to piping.	Moderate water intake rate; root zone mainly in top 15 to 24 inches above fragipan; moderate to high available water capacity; highly erodible.	Highly erodible; seepage and siltation problems; seasonal high water table 1½ to 2 feet below surface.	Ditchbanks unstable; highly erodible; some siltation problems; moderately well drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Fill material	Highway location	Embankment foundation [1]
Windsor: WnA, WnB, WnC	Poor: sandy; erodible; subject to soil blowing.	Good for sand. Poor for gravel.	Good: erodible; subject to soil blowing; positive drainage control needed.	Grade location not critical above water table, normally several feet below surface, locally within 3½ feet of surface in places; cut slopes erodible and subject to soil blowing; seepage and sloughing problems if water table is in cuts; subgrade in cuts subject to differential frost heaving; poor trafficability.	Generally adequate strength for moderately high embankments.

[1] Engineers and others should not apply specific values to estimates given for bearing capacity of soils.
[2] References to permeability in this column are to permeability when compacted.

Available water capacity.—Available water is 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. A dash in this column indicates that very few or no roots penetrate a particular soil layer.

Reaction.—The degree of acidity or alkalinity is expressed as the pH value of the unlimed soils. In soils that have been cropped and have received large applications of lime over a period of several years, the reaction may be higher than the value shown in table 5.

The miscellaneous land types are listed in the stub of table 5, but properties are not given because the soil material is variable and onsite evaluation is necessary. Following is a general description of three of these land types.

Rough broken land consists of very steep land that is the result of dissection by numerous intermittent streams. The dissections are mainly in deep glacial till along valley sides, and to a lesser degree through glacial outwash and lacustrine deposits. Runoff is very rapid, and active geologic erosion takes place.

Sandstone rock land consists of areas having enough sandstone rock outcrop and very shallow soil over sandstone to override other soil characteristics. Between 25 and 90 percent of the acreage of this land type consists of exposed bedrock. This land type is nearly level to very steep. In places the bedrock is granite rather than sandstone.

Shaly rock land, very steep, consists of very steep areas having enough shale rock outcrop or very shallow soil over shale to override other soil characteristics. Between 25 and 90 percent of the acreage of this land type consists of exposed shale bedrock. Runoff is very rapid, and active geologic erosion takes place.

Engineering interpretations

Table 6 gives the suitability ratings for soils as a source of topsoil, sand, gravel, and fill material, and the features of soils that affect stated engineering practices. Some of the soil uses listed in table 6 are those that affect soil and water conservation, such as farm ponds, drainage systems, irrigation, diversion terraces, and waterways. The interpretations given in table 6 are intended to provide guidelines for the use of soils in engineering and to indicate potential hazards that require unusual procedures or special precautions in planning.

The suitability of soils as a source of topsoil, sand and gravel, or fill material is rated in table 6 as good, fair, poor, or unsuitable.

Topsoil.—The texture, depth, and organic-matter content of the soil were used in determining the suitability ratings for topsoil. For example, a soil is rated good if it has silt loam or loam texture, is free of rock fragments, and is high in content of organic matter. In contrast, a clayey soil or one that contains many rock fragments is rated unsuitable. Medium-textured, alluvial soils generally are the most suitable as a source of topsoil.

Sand and gravel.—The suitability of soils as possible sources of granular material (sand and gravel) depends mainly on the texture and arrangement of the material in the substratum. Well-sorted glacial outwash and some types of alluvial material are the best potential sources of sand and gravel in the survey area. The quality of the deposit is not indicated by the suitability rating.

Fill material.—Fill material is used in dams, pavement bases, highway embankments, parking lots, and similar structures; and the selection of fill material should be determined by the intended use. The more important soil features to be considered are texture, stoniness, permeability, compressibility, shrink-swell potential, organic-matter content, and moisture content.

interpretations—Continued

Soil features affecting—Continued						
Foundations for low buildings	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments [2]				
Generally adequate strength; compressible under vibratory loads.	Rapid permeability.	Sandy material; fair to good stability; moderately pervious; susceptible to piping; difficult to vegetate; erodible.	Agricultural drainage generally not needed: excessively drained.	Rapid water intake rate; unrestricted root zone; very low to moderate available water capacity; WnC has adverse slopes.	Sandy material; rapid permeability; erodible; susceptible to soil blowing and siltation; low fertility; difficult to vegetate.	Sandy material; erodible; susceptible to soil blowing and siltation; low fertility; difficult to vegetate; excessively drained.

Highway location.—The more important features that influence the location of highways are texture, organic-matter content, permeability, drainage, compressibility, slope, depth to bedrock, hazard of flooding, strength, stability after compaction, and shrink-swell potential. Most soils of the uplands have a dense, slowly permeable fragipan or dense till layer in the lower part of the profile. Where possible, the gradeline should be planned to avoid cutting into or out of these layers.

Embankment foundation.—Among the more important soil features that determine the use of soils for embankment foundations are texture, strength, compressibility, stability, drainage, and depth to bedrock. Most soils that developed in deep glacial till provide good embankment foundations, but those that developed in glacial outwash, lacustrine sediment, and alluvium are variable. Mucky soils are unsuitable and should be avoided where possible.

Foundations for low buildings.—Among the features that affect use of soils for foundations are drainage, slope, hazard of flooding, strength, susceptibility to frost action, and shear strength. If foundations for large buildings are to be constructed, detailed subsurface investigation is necessary, and design should be based on the investigation. A general subsurface investigation may suffice for residences and light commercial buildings. Basement seepage is the most conspicuous and troublesome problem in building foundations on soils of Herkimer County. In most places foundation drains and proofing against dampness and seepage are necessary.

Farm ponds.—The reservoir area of ponds depends on the ability of the soil to hold water. Except in areas where the water table is near the surface, rapidly permeable material, such as sand and gravel, generally has severe limitations as reservoir areas. Most soils that formed in glacial till have impeded permeability and are suitable, but in places they have sandy or gravelly layers that allow excessive seepage. Embankments for the impoundment of water depend on the ability of compacted soil material to stop the flow of water. Poorly graded sandy and silty materials disperse readily and are subject to piping. These materials should be avoided in building embankments to hold water.

Agricultural drainage.—The main soil features that affect agricultural drainage are texture, permeability, depth to the water table, depth to bedrock, slope, stability, and the hazard of flooding. In Herkimer County most poorly drained upland soils have a dense fragipan or panlike layer that retards the movement of water. Both surface and subsurface interception drains may be needed. Lenses of sand and gravel are in some of the soils that developed in glacial till. These lenses cause piping and instability of drainage structures. Soils that developed in water-laid material contain layers of poorly graded silt, fine sand, or sand in places. These layers adversely affect open ditches and subsurface drains. Unless subsurface drains on these soils are protected, they may become plugged with silt and fine sand.

Irrigation.—The main soil features that affect irrigation are drainage, permeability, infiltration rate, available moisture capacity, thickness of the root zone, slope, and erodibility. Soils that developed in gravelly or sandy glacial outwash normally are droughty and have moderate to low available moisture capacity. Some soils that developed in glacial till and soils that are shallow to bedrock have layers near the surface that impede the movement of water and restrict penetration by roots. If sloping areas of erodible soils are irrigated, erosion-control measures are needed.

Diversions.—The important features that affect the building of diversions are slope, permeability, depth to bedrock or other impervious material, stability, and erodibility. Where diversions are built in soils that have a slowly permeable layer, the diversions should be deep enough to prevent seepage along the top of the layer. Piping can occur where sandy or silty layers are cut in building diversions, and the layers are also subject to eroding, sloughing, and slumping.

Waterways.—The same soil features that affect diversions also affect waterways. Where waterways are constructed in soils having a shallow, slowly permeable layer, prolonged seepage is likely. This seepage makes the establishment and maintenance of protective vegetation difficult.

Construction of embankments can proceed in winter, but during freezing weather, much greater compactive effort is required to obtain the minimum acceptable degree of compaction of soils. As the temperature falls below 20° to 25° F., it becomes virtually impossible to attain a satisfactory degree of densification with standard compaction equipment, even when working with relatively clean sand and gravel. Highway embankments constructed during freezing temperatures generally settle unevenly for a period of years, and consequently the pavement becomes rough. Thus, winter work on construction of embankments should be limited to the placement of rock fills. The surfaces of partly constructed embankments that are left exposed during winter months should be crowned and rolled smooth so that they will shed water and prevent infiltration.

Frost effects in soils relate to construction. All of the soils in the survey area are subject in varying degrees to the effects of freezing and thawing of soil water. Frost acts on soil and rock material and on the structures founded on them, and measures to combat frost damage are generally needed for all types of construction.

Two types of frost heaving occur. One is called uniform heave, and the other, differential heave.

Uniform heave takes place in areas where soil texture and ground water conditions are uniform. Essentially none of the soils in Herkimer County are in such an area, although skin cuts on the soils in places reveal these conditions.

Differential heave takes place in areas where soil textures in contiguous strata vary; at cut and fill transitions where ground water is close to the surface; or in soils that contain various sizes of rock fragments in the frost zone, especially those greater than 10 inches in size. Differential heave also occurs in places where lateral drains, culverts, and approach fills to bridges and overpasses break the uniformity of subgrade conditions. Differential heave is most serious in nonuniform, stratified gravelly outwash deposits in which such soils as Howard, Palmyra, and Phelps formed. Large rock fragments that cause so-called boulder heave are most commonly found in soils formed in glacial till deposits on uplands, such as Canton and Broadalbin soils.

Differential heave produces more pavement stressing and surface roughness than uniform heave.

The freezing and thawing effect on all soils in the county causes deterioration of thin pavements and unpaved roads, as well as loss of density of supporting soils. On cut slopes it causes displacement of cobblestones and other stones, as well as soil creep. It also causes weathering and dislodgment of rock in rock cuts. During periods of thawing, subgrade support is lost and drainage is restricted by the still frozen layer during the thawing process.

Engineering properties of geologic deposits

Soils vary in many ways. They formed generally in deposits that resulted from various geologic processes. Some deposits are graded mixtures of various textures; others are single grained. Some are very loose; others are extremely compact. Drainage conditions also vary. Some deposits are permanently wet; others, for a considerable portion of the year, are very dry in places. Some can support heavy loads with negligible settlement or deformation; others require extensive treatment to support even light fills or small buildings.

The soils of the county can be placed in broad categories that have significant engineering differences. The Bureau of Soil Mechanics of the New York State Department of Transportation uses the depositional unit basis as the first broad separation of the soils. In Herkimer County, all the soils and some of the land types have been placed in the following depositional categories: deep glacial till, thin glacial till, glacial outwash, lacustrine and old alluvial sediment, recent alluvium, and organic deposits. These are discussed in detail in the paragraphs that follow.

DEEP GLACIAL TILL

Glacial till deposits formed from soil and rock fragments that were picked up, transported, abraded, mixed, and deposited by the action of glacial ice. The results are highly variable assortments of soil and rock material whose particle size ranges from ledgey rock fragments and large boulders to clay. In general, no stratification is evident; however, inclusions are present locally. These can be interstratified sand and gravel or pockets of silt and clay. In addition, where ice advances occurred in waves, bed-on-bed deposits of till are present. Here, a degree of false stratification is evident, and contiguous beds often have differing textures.

Most of the till deposits of the county have been subjected to the compactive weight of overriding ice and are very dense and compact. The deposits laid down during ablation stages or down-wasting and back-wasting periods of glaciation are generally not as dense, because they have not been overridden. Some of these deposits of deep till are overlain by a thin veneer of windblown or water-laid silt, very fine sand, or clay. In this survey area, deep till deposits are ordinarily 3½ feet or more thick over bedrock.

Soils formed mainly in dense basal till are Appleton, Conesus, Hilton, Honeoye, Lansing, Lima, Manheim, Massena, Mohawk, and Ontario, and some of the Bombay, Ilion, Lyons, and Sun soils.

Very few of the deposits are level. Slopes range mainly from gentle to very steep. The terrains are such that cut-and-fill earthwork is involved in most construction.

Based on results from a limited number of tests, the in-place density of the C horizon of soils formed in these till deposits ranges from 106 pounds per cubic foot to 126 pounds per cubic foot, as determined by ASTM Designation D1556. Maximum density ranges from 103 pounds per cubic foot to 127 pounds per cubic foot, as determined by compaction tests conducted in accordance with the procedures of AASHO Designation T–99, Method C. Netural moisture content ranges from 11 percent to 25 percent, and optimum moisture content for compaction ranges from 9 to 22 percent. Test results are from samples obtained from relatively shallow depths. Deep cuts in these till deposits encounter bedrock in places. This is particularly true where areas of deep till are adjacent to thin till areas. Mohawk soils in Herkimer County, though placed in the deep-till category, generally are 3½ to 5 feet thick over shale bedrock.

For highway engineering purposes, earthwork involves both longitudinal and sidehill cuts and fills. In the well-drained soils that formed in dense till, cuts, when properly designed, are fairly stable, and subgrades are generally satisfactory. The constantly recurring exception is sloughing on cut slopes, which is associated with frost withdrawal or with large amounts of runoff being received. The compact condition of the till impedes infiltration; and runoff, unless intercepted, causes severe sloughing. These till deposits furnish good embankment sites in places where they are not too steep. They are also a source of fill material for embankments. In some areas, large stones and boulders are in the soil material and interfere with fill placement in thin lifts.

For residential developments, the sloping till deposits can involve considerable grading. The compact, quite impervious nature of the deposits imposes some difficulties where sewage is disposed of by effluent field. Where the stone content of the soil is high, lawns and athletic fields involve hazards to both mowing equipment and users of the areas.

Soils of the Broadalbin, Burdett, and Mosherville series and some soils of the Bombay, Ilion, Lyons, and Sun series formed in veneers, 12 to 36 inches thick, of windblown or water-laid silt or very fine sand over the dense basal till. In Herkimer County, the loamy substratum phases of Hudson and Rhinebeck soils formed in lacustrine silt and clay that are 3½ to 5 feet thick over till, outwash, or bedrock. Densities and drainage between these contrasting deposits vary considerably, and shallow cuts and fills encounter nonuniform soil conditions that can cause problems of differential heave. Otherwise, these soils behave much the same as those formed in dense basal till.

During the ablation or wasting stages of glaciation, comparatively loose till deposits were left in place. They are closely associated with deposits of dense basal till as well as crudely sorted deposits of gravelly and sandy material. Soils of the Canton series and some soils of the Bombay series formed in these ablation or morainic tills. Typically, these deposits are on undulating to rolling landscapes where slopes are short, and are comparatively easy to recognize. These deposits require the greatest amount of subsurface investigation to determine their engineering properties. The subgrade in cuts is subject to differential heave and boulder heave. Also, boulders in places lose their embedment in cuts.

THIN GLACIAL TILL

Thin glacial till is similar to deep till, but the depth to bedrock is generally less than 3½ feet. Except for a few places, the till is weathered and the less dense material of the solum extends to bedrock. Rock fragments are common in the soil mass, and even in light grading operations bedrock generally is encountered in cuts.

Soils formed in thin glacial till are the Allis, Farmington, Hornell, Lairdsville, Lockport, Manlius, Nassau, Palatine, and Wassaic. Allis, Hornell, Lairdsville, Lockport, Manlius, Nassau, and Palatine soils are over shale. Layers of more resistant sandstone or siltstone, however, are present in places. The Farmington and Wassaic soils are generally over limestone, but in some places the bedrock is sandstone.

Thin tills generally furnish satisfactory embankment foundations for highway fills because the soil thickness is so slight that little soil settlement can occur, and the rocks are relatively unyielding. Some of the areas are on very steeply sloping landscapes, however; and shear keys are necessary to prevent fills from sliding.

These thin till areas present limitations for residential use. Basement excavations can encounter the underlying bedrock. Basement seepage can also be a problem, and facilities associated with developments such as sewer installations and water and gas lines require rock excavation. Sewage disposal by septic tank is difficult, and special design of such systems is sometimes necessary.

Thin till material can be used for highway fills. Where only the soil is used, a small volume per acre exists above the rock. If material from cuts involving both the soil and the underlying bedrock is used as fill material, considerable difficulty can ensue in placing it in layers thin enough to attain good compaction with most standard compaction equipment, especially if the blasted rock fragments are large and, hence, oversize for thin lifts.

Some of the thin glacial till deposits are relatively level. Here, a moderately elevated gradeline can eliminate the need for blasting the underlying bedrock for drainage ditches.

Where highway cuts and fills are made, a definite need for transition sections exists. Some highway-cut slopes involve a combination of soil and rock cuts, and the slope in soil must generally be flatter than that in rock. Sloughing at the soil-rock interface is common. High rock slopes can require special design, depending on the rock structure and its weathering characteristics. A study of bedrock geology can provide additional information.

These soils are not good sources of sand and gravel. The rock under Farmington and Wassaic soils is a possible source of limestone for crushing.

GLACIAL OUTWASH

These deposits consist mainly of sorted sand and gravel deposited by glacial melt waters. They occupy such geologic landforms as outwash terraces, eskers, valley trains, kames, kame terraces, kame moraines, and outwash fans. Many of the deposits, especially those on deltas and outwash fans, are underlain by or contain silt lenses and clay strata that impede drainage.

The soils that developed on glacial outwash are the Fredon, Halsey, Herkimer, Hinckley, Howard, Palmyra, and Phelps.

Depending on their soundness, plasticity, and gradation, local outwash deposits can be used for fill material for highway embankments; fill material for parking areas and developments; fill material to decrease stress on underlying soils so construction operations can progress; subbase for pavements; wearing surfaces for driveways, parking lots, and low-class roads; material for highway shoulders; granular backfill for structures and pipes;

outside shells of impounding dams (these materials are unsuited for use as fill materials for the impervious portions of dams); abrasives for control of snow and ice on highways; slope-protection blankets to drain some wet slopes; granular blankets to prevent pumping under concrete pavements; and sources of aggregate for concrete.

Deposits in which soils of the Herkimer and some of the associated Fredon and Halsey series formed have a high content of shale and generally lack the soundness and gradation desired for most of the above-mentioned uses, with the exception of subsurface fills.

Some outwash deposits are on extensive, flat terraces and deltas, which, if well drained, are excellent locations for highways and other developments. Granular material in these deposits is commonly underlain by wet silt and clay that are soft and weak. This possibility must always be considered on sites for proposed heavy fills and structures. Kames and kame moraines require considerable grading for highways and other facilities. These steep-sided granular deposits have excellent surface drainage, but silt strata that retard internal drainage can be found in all types of outwash deposits. If these silt strata are intercepted by a highway gradeline or are near the top of the subgrade in cuts, differential heave takes place. For highways and other paved areas, undercutting is necessary in places to prevent differential heave and to provide uniform subgrade support. Cuts in these materials can be dry during construction seasons; and it is, thus, difficult to foresee the adverse moisture conditions that could develop in wet periods.

LACUSTRINE AND OLD ALLUVIAL SEDIMENT

These deposits are relatively stone free and occupy glacial lake plains, deltas, beaches, and glacial stream terraces, mainly along the larger valleys. In places they are intermingled in upland areas where local ponding once prevailed. The deposits range in texture from fine sand to silt and clay.

The soils that developed in lacustrine and old alluvial sediment are the Agawam, Windsor, Lamson, Hartland, Raynham, Williamson, Hudson, and Rhinebeck.

Soils of the Agawam and Windsor series formed in sandy sediment. In places the Windsor soils appear as sand dunes. Soils of the Lamson series formed in sand and very fine sand, and those of the Hartland, Raynham, and Williamson series in silt and very fine sand. Soils of the Hudson and Rhinebeck series formed in deposits of silt and clay. In Herkimer County the Hudson and Rhinebeck soils are generally underlain at depths of 3½ to 5 feet by deposits of glacial till or glacial outwash and, in places, by bedrock. Many engineering uses of these soils are governed by the nature of these substratum deposits and of the surficial deposits of silt and clay.

These deposits are nearly level to moderately steep. They are highly erodible, even on slight grades. Wherever they are on steeply sloping fronts of terraces, erosion is generally severe. Also, the sandy sediment of Agawam, Hartland, and Windsor soils is subject to soil blowing. Except for the sandy Agawam, Hartland, and Windsor soils, infiltration is restricted and, where the soil is nearly level, runoff is slow or very slow. Wetness generally increases with depth, and some deposits can have a natural moisture content of up to 60 or 70 percent. The optimum moisture content for silty-clayey soils ranges from 10 to 20 percent, in accordance with ASTM—Estimated Designation D1556. Consequently, a predetermination of moisture content is necessary prior to consideration of the use of these deposits for borrow material.

Because it is weak and drainage is often difficult, wet lacustrine sediment is more difficult to use in engineering works than almost any other mineral soil material in the survey area. In places highway gradelines must be kept high. Sites for high embankments and heavy buildings must be investigated thoroughly for strength, settlement characteristics, and depth to the water table. Such sediment is highly susceptible to frost action, and loses strength seasonally when the moisture content is increased by thawing. It is difficult to work when wet. A drainage course is needed beneath highway pavements and parking lots that are to be constructed on the finer textured sediment. Consideration should be given to using a transition filter under the drainage course. These filters will prevent the movement or piping of the fine-textured lacustrine sediment into the drainage course.

A blanket of granular material can be used on cut slopes to prevent sloughing, or the cuts can be made less sloping. In building embankments the moisture content of clayey material should be carefully controlled. In most places foundations are poor, and considerable settlement takes place under heavy loads and structures. Foundations of bridges and buildings often require piles for support, unless the loads are light. During wet periods trafficability over fine-textured soils is poor. It is also poor on the noncohesive, sandy deposits.

RECENT ALLUVIUM

These deposits consist of strata of sediment of varying textures that is deposited on the flood plains of present-day streams.

Alluvial land and soils of the Cohoctah, Hamlin, Teel, and Wayland series formed in recent alluvium.

These alluvial deposits have a fluctuating but generally shallow water table and are subject to annual or sometimes more frequent overflow. In places these areas are underlain by soft, wet, compressible lacustrine sediment or by muck.

Cuts are generally not practical, because even light cuts encounter a water table. Since the areas are subject to overflow, the gradeline should be above flood elevation.

Foundation conditions are generally poor on alluvial areas. Thorough investigation and, on some locations, special analysis and design are required before foundations for bridges and high embankments are constructed on these soils. Alluvial deposits are subject to flooding and should be avoided as building sites. The hazard of flooding and the depth to the water table must be carefully evaluated before these areas are considered for any building purposes.

Most alluvial deposits are sources of good topsoil.

ORGANIC DEPOSITS

Organic deposits are formed by the accumulation of plant and animal remains. They are in poorly drained, depressional areas. Carlisle muck and Palms muck are the only soils in Herkimer County that formed in organic deposits.

Organic deposits are entirely unsuitable for highway or other embankment sites, or for building foundations.

because they are highly compressible and unstable. Generally, for highways, organic deposits and any other unsuitable material underlying them should be removed and replaced with suitable backfill. Backfill below the water table should be made with broken rock or granular material. The gradeline on these areas must be above the high water elevation. Organic soils can be used to amend the unsatisfactory physical conditions of both sandy and clayey soils if they are to be used as topsoil.

Use of the Soils for Town and Country Planning

This section is of special interest to developers, planners, and others who are concerned with community and recreational planning and development and to individuals who plan to build a home and are concerned with the choice of a homesite. Table 7 lists the soils of the survey area and shows the soil features that are most limiting and the estimated degree to which these features affect use of soils for various purposes. In most places soil investigations for the survey did not extend to depths below 3½ to 5 feet. Also, included in mapping were small spots of soils that differ from the dominant soil for which the mapping unit is named. Consequently, onsite determination is necessary for most uses, especially those that require deep excavations, such as sanitary landfills.

The main soil features considered in rating soils for the various uses were slope; depth to a seasonal high water table; soil permeability, or the rate at which water moves through the soil; the presence of hard bedrock, which generally requires blasting before it can be removed; the presence of soft bedrock, which generally can be removed with power tools; stoniness, or the presence of large stones 10 inches or more across; rockiness, or areas where bedrock is exposed or covered with a very thin soil mantle; texture of the surface layer, or particle-size (sand, silt, clay, gravel, cobblestones, and shale) distribution; and the hazard of flooding or ponding.

In table 7 the limitations of the soils in the county are rated slight, moderate, or severe. One or more chief limitations for the use specified are listed if the limitations are rated moderate or severe. A rating of *slight* indicates that the soil has few or no limitations and is considered desirable for the use named. A rating of *moderate* shows that a moderate problem is recognized but can be overcome or corrected. A rating of *severe* indicates that use of the soil is seriously limited by a hazard or restriction that is difficult to overcome. A rating of severe for a particular use does not imply that a soil so rated cannot be put to that use. It should be recognized that large-scale cuts or fills in an area can alter the natural soil so much that ratings given in the table no longer apply.

Any one property may not restrict all types of nonfarm uses equally. For example, an occasional flooding is a moderate limitation for play and picnic areas but severely limits the use of a soil for homesites and low buildings.

Following are explanations of the uses rated in the table.

Disposal of septic tank effluent.—This rating indicates the kind and degree of limitation to be expected when using a soil for a septic tank filter field. Considered in the ratings were permeability of the soil layers at and below the tile line, depth to seasonal high water table, depth to bedrock, surface rockiness, slope, surface stoniness, and flooding hazard. Temporary wetness, slow permeability, and depth to bedrock are the most common limitations encountered in locating septic tank filter fields.

Homesites and low buildings.—This rating is for homes and buildings of three stories or less. Separate ratings are given for structures with and without basements. Considered in rating the soils were depth to the seasonal high water table, slope, depth to bedrock, surface rockiness, surface stoniness, and flooding hazard. A seasonal high water table is the most common limitation for this use. Wetness limits structures with basements more than structures without basements.

Lawns and fairways.—The interpretations refer to the use of the soil in place with no importation of fill or topsoil. Depth to seasonal high water table, slope, depth to bedrock, surface rockiness, surface stoniness, surface soil texture, and flooding hazard were considered in determining limitations for lawns, landscaping, and golf fairways. If possible, fairways should be located on soils that are deep, well drained or moderately well drained, and no more than moderately sloping, and that have a minimum of stones and cobblestones.

Sanitary landfills.—It is assumed that the landfill operations for the disposal of trash and garbage is performed by the trench method. Importation of fill or cover material was not considered in the ratings. Depth to bedrock, depth to seasonal high water table, risk of free flow of potential pollutants to ground water, slope, dominant texture of soil, surface stoniness, and flooding hazard were the soil properties considered in determining limitations for sanitary landfills. In general, soils that are deep, well drained, not stony, not too permeable, not too plastic and sticky, not flooded, and level or gently sloping are suitable for sanitary landfills. Deep, well drained, nearly level to gently sloping soils formed in glacial till on uplands are among the soils better suited to this use in the survey area.

Streets and parking lots.—This refers to the use of soil for location of hard-surfaced roads similar to town or township roads, or for streets and parking lots in subdivisions. Special layout requires onsite investigation. Soil requirements and limitations for streets and parking lots are similar to those for highways. The main properties used in rating the soil were depth to seasonal high water table, slope, depth to bedrock, surface rockiness, surface stoniness, and flooding hazard.

Play and picnic areas.—The natural beauty of the landscape is important in considering areas for hiking, picnicking, and similar kinds of recreation. These areas are left essentially in their natural state. Problems of water supply and sewage disposal were not considered in the ratings. The main soil characteristics considered were depth to seasonal high water table, slope, depth to bedrock, surface rockiness, surface stoniness, surface soil texture, and flooding hazard.

Campsites.—This rating is for the use of soils for either tent or trailer campsites. It is assumed that these areas receive frequent use during the camping season, involving heavy foot and vehicular traffic. Problems of sewage disposal, water supply, and access roads were not

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings		Lawns and fairways
		With basements	Without basements	
Allis: Aa	Severe: seasonally high water table less than 12 inches below surface; 20 to 40 inches deep to rippable bedrock; slow permeability.	Severe: seasonally high water table less than 12 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: seasonally high water table less than 12 inches below surface.	Severe: seasonally high water table less than 12 inches below surface.
Alluvial land: Ad	Severe: floods one or more times each year.	Severe: floods one or more times each year.	Severe: floods one or more times each year.	Severe: floods one or more times each year.
Appleton:				
ApA	Severe: seasonally high water table 6 to 18 inches below surface; moderately slow or slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
ApB	Severe: seasonally high water table 6 to 18 inches below surface; moderately slow or slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
Appleton and Manheim: AtB.	Severe: seasonally high water table 6 to 18 inches below surface; stoniness; moderately slow or slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface; stoniness.	Moderate: seasonally high water table 6 to 18 inches below surface; stoniness.	Severe: seasonally high water table 6 to 18 inches below surface; stoniness.
Bombay:				
BoB	Severe: moderately slow to slow permeability.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Slight
BoC	Severe: moderately slow to slow permeability; slope.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Moderate: slope	Moderate: slope
Broadalbin:				
BrB	Severe: slow permeability.	Moderate: seasonally high water table 18 to 30 inches below surface.	Slight	Slight
BrC	Severe: slow permeability; slope.	Moderate: seasonally high water table 18 to 30 inches below surface; slope.	Moderate: slope	Moderate: slope
BrD	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Broadalbin and Lansing: BsD.	Severe: stoniness; slope in places.	Severe: stoniness; slope in places.	Severe: stoniness; slope in places.	Severe: stoniness; slope in places.
Burdett:				
BuA	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
BuB	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
BuC	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.

See footnotes at end of table.

the soils for town and country planning

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: seasonally high water table less than 12 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: seasonally high water table less than 12 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: seasonally high water table less than 12 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: seasonally high water table less than 12 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: seasonally high water table less than 12 inches below surface; 20 to 40 inches deep to rippable bedrock.
Severe: floods one or more times each year.	Severe: floods one or more times each year.	Severe: floods one or more times each year.	Severe: floods one or more times each year.	Severe: floods one or more times each year.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; slope.
Severe: seasonally high water table 6 to 18 inches below surface; stoniness.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface; stoniness.	Severe: seasonally high water table 6 to 18 inches below surface; stoniness.	Severe: seasonally high water table 6 to 18 inches below surface; stoniness.
Severe: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.
Severe: seasonally high water table 18 to 24 inches below surface; slope.	Severe: slope; seasonally high water table 18 to 24 inches below surface.	Moderate: slope	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Severe: seasonally high water table 18 to 24 inches below surface; slope.
Severe: seasonally high water table 18 to 30 inches below surface.	Moderate: seasonally high water table 18 to 30 inches below surface; slope.	Slight	Moderate: seasonally high water table 18 to 30 inches below surface; slow permeability.	Moderate: seasonally high water table 18 to 30 inches below surface; slope; slow permeability.
Severe: seasonally high water table 18 to 30 inches below surface; slope.	Severe: slope	Moderate: slope	Moderate: seasonally high water table 18 to 30 inches below surface; slope; slow permeability.	Severe: slow permeability; slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slow permeability; slope.
Severe: stoniness; slope in places.	Severe: stoniness; slope in places.	Severe: stoniness; slope in places.	Severe: stoniness; slope in places.	Severe: stoniness; slope in places.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; slope.
Severe: seasonally high water table 6 to 18 inches below surface; slope.	Severe: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Severe: seasonally high water table 6 to 18 inches below surface; slope.	Severe: seasonally high water table 6 to 18 inches below surface; slope.

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings: With basements	Homesites and low buildings: Without basements	Lawns and fairways
Canton:				
CaB	Slight [2]	Slight	Slight	Slight
CaC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Moderate: slope
Carlisle: Cm	Severe: water table at or near surface.	Severe: water table at or near surface.	Severe: water table at or near surface.	Severe: water table at or near surface.
Cohoctah: Co	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.
Conesus: CsB	Severe: slow or very slow permeability.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Slight
Cut and fill land: Cu. All properties variable.				
Farmington:				
FaC	Severe: bedrock at depth of less than 20 inches.	Severe: bedrock at depth of less than 20 inches.	Moderate: bedrock at depth of less than 20 inches.	Severe: bedrock at depth of less than 20 inches.
FcD	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: slope; very rocky.	Severe: bedrock at depth of less than 20 inches; slope.
Farmington-Rock land: FkE.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: slope; very rocky.	Severe: bedrock at depth of less than 20 inches; slope.
Fredon: Fr	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
Fresh water marsh: Fw	Severe: permanently under water.	Severe: permanently under water.	Severe: permanently under water.	Severe: permanently under water.
Halsey: Ha	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Hamlin: He, Hf	Severe: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years.
Hartland:				
HgB	Slight [2]	Slight	Slight	Slight
HgC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Moderate: slope
HgD	Severe: slope [2]	Severe: slope	Severe: slope	Severe: slope
Herkimer:				
HhA	Slight [2]	Slight	Slight	Moderate: gravelly texture.
HhB	Slight [2]	Slight	Slight	Moderate: gravelly texture.
HkB	Moderate: seasonally high water table 18 to 24 inches below surface.[2]	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Moderate: gravelly texture.

See footnotes at end of table.

the soils for town and country planning—Continued

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: rapid permeability.[2]	Moderate: slope	Slight	Slight	Moderate: stoniness; slope.
Severe: rapid permeability.[2]	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope.
Severe: water table at or near surface; high in organic material.	Severe: water table at or near surface.	Severe: water table at or near surface.	Severe: water table at or near surface.	Severe: water table at or near surface.
Severe: seasonally high water table less than 6 inches below surface; subject to flooding.	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.	Severe: seasonally high water table less than 6 inches below surface; subject to flooding.
Severe: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.
Severe: bedrock at depth of less than 20 inches.	Severe: bedrock at depth of less than 20 inches.	Severe: bedrock at depth of less than 20 inches.	Severe: bedrock at depth of less than 20 inches.	Severe: bedrock at depth of less than 20 inches.
Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.
Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.	Severe: bedrock at depth of less than 20 inches; slope.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.
Severe: permanently under water.	Severe: permanently under water.	Severe: permanently under water.	Severe: permanently under water.	Severe: permanently under water.
Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Severe: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years.
Slight [2]	Moderate: slope	Slight	Slight	Moderate: slope.
Moderate: slope [2]	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope.
Severe: slope [2]	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight [2]	Slight	Slight	Slight	Severe: gravelly texture.
Slight [2]	Moderate: slope	Slight	Slight	Severe: gravelly texture; slope.
Severe: seasonally high water table 18 to 24 inches below surface.[2]	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Severe: seasonally high water table 18 to 24 inches below surface; gravelly texture.

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings		Lawns and fairways
		With basements	Without basements	
Hilton:				
HlB	Severe: slow permeability.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Slight
HlC	Severe: slow permeability.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Moderate: slope	Moderate: slope
Hinckley:				
HmA	Slight [2]	Slight	Slight	Severe: gravelly loamy sand texture.
HmB	Slight [2]	Slight	Slight	Severe: gravelly loamy sand texture.
HmC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Severe: gravelly loamy sand texture; slope.
Hinckley and Windsor: HnD, HnF.	Severe: slope [2]	Severe: slope	Severe: slope	Severe: slope
Honeoye:				
HoB	Severe: slow permeability.	Slight	Slight	Slight
HoC	Severe: slow permeability; slope.	Moderate: slope	Moderate: slope	Moderate: slope
HoD	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Honeoye and Lansing: HrE	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Honeoye and Mohawk: HsD	Severe: slow permeability.	Severe: stoniness; slope.	Severe: stoniness; slope.	Severe: stoniness; slope.
Hornell:				
HtA	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock; slow permeability.	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.
HtB	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock; slow permeability.	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.
HtC	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock; slow permeability.	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.

See footnotes at end of table.

the soils for town and country planning—Continued

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.
Severe: seasonally high water table 18 to 24 inches below surface; slope.	Severe: seasonally high water table 18 to 24 inches below surface; slope.	Moderate: slope	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Severe: seasonally high water table 18 to 24 inches below surface; slope.
Severe: less than 6 feet deep to porous sand and gravel.[2]	Slight	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture.
Severe: less than 6 feet deep to porous sand and gravel.[2]	Moderate: slope	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture; slope.
Severe: less than 6 feet deep to porous sand and gravel; slope.[2]	Severe: slope	Moderate: gravelly texture; slope.	Moderate: gravelly texture; slope.	Severe: gravelly texture; slope.
Severe: less than 6 feet deep to porous sand and gravel; slope.[2]	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Moderate: slope	Slight	Slight	Moderate: moderate to moderately slow permeability; slope.
Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope; moderate to moderately slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: stoniness; slope	Severe: slope	Severe: slope	Severe: stoniness; slope	Severe: stoniness; slope.
Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 24 inches below surface.	Severe: seasonally high water table 6 to 24 inches below surface.	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.
Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: seasonally high water table 6 to 24 inches below surface.	Severe: seasonally high water table 6 to 24 24 inches below surface.	Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.
Severe: seasonally high water table 6 to 24 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: seasonally high water table 6 to 24 inches below surface; slope.	Severe: seasonally high water table 6 to 24 inches below surface; slope.	Severe: 20 to 40 nches deep to rippable bedrock; slope.

525-444—75——7

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings: With basements	Homesites and low buildings: Without basements	Lawns and fairways
Howard:				
HuA	Slight [2]	Slight	Slight	Moderate: gravelly texture.
HuB	Slight [2]	Slight	Slight	Moderate: gravelly texture.
HuC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Moderate: gravelly texture; slope.
HvA	Slight [2]	Slight	Slight	Moderate: gravelly texture.
HvB	Slight [2]	Slight	Slight	Moderate: gravelly texture.
HvC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Moderate: gravelly texture; slope.
Howard and Palmyra:				
HwD	Severe: slope [2]	Severe: slope	Severe: slope	Severe: slope
Hudson:				
HyB	Severe: slow permeability.	Moderate: seasonally high water table 18 to 30 inches below surface.	Slight	Slight
HyC	Severe: slow permeability.	Moderate: seasonally high water table 18 to 30 inches below surface; slope.	Moderate: slope	Moderate: slope
HyD	Severe: slope; slow permeability.	Severe: slope	Severe: slope	Severe: slope
Ilion: In	Severe: seasonally high water table less than 6 inches below surface; slow permeability.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Ilion and Sun: Is	Severe: seasonally high water table less than 6 inches below surface; slow permeability.	Severe: seasonally high water table less than 6 inches below surface; stoniness.	Severe: seasonally high water table less than 6 inches below surface; stoniness.	Severe: seasonally high water table less than 6 inches below surface; stoniness.
Lairdsville:				
LaB	Severe: 20 to 40 inches deep to rippable bedrock; seasonal high water table 18 to 30 inches below surface.	Moderate: 20 to 40 inches deep to rippable bedrock; seasonal high water table 18 to 30 inches below surface.	Slight	Moderate: 20 to 40 inches deep to rippable bedrock.
LaC	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: slope	Moderate: 20 to 40 inches deep to rippable bedrock; slope.
LaD	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: slope	Severe: 20 to 40 inches deep to rippable bedrock; slope.
Lamson: Lk	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Lansing:				
LnC	Severe: slow or very slow permeability; slope.	Moderate: slope	Moderate: slope	Moderate: slope
LnD	Severe: slow or very slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope

See footnotes at end of table

the soils for town and country planning—Continued

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: less than 72 inches deep to porous sand and gravel.[2]	Slight	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture.
Severe: less than 72 inches deep to porous sand and gravel.[2]	Moderate: slope	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture; slope.
Severe: less than 72 inches deep to porous sand and gravel; slope.[2]	Severe: slope	Moderate: gravelly texture; slope.	Moderate: gravelly texture; slope.	Severe: gravelly texture; slope.
Severe: less than 72 inches deep to porous sand and gravel.[2]	Slight	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture.
Severe: less than 72 inches deep to porous sand and gravel.[2]	Moderate: slope	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture; slope.
Severe: less than 72 inches deep to porous sand and gravel.[2]	Severe: slope	Moderate: gravelly texture; slope.	Moderate: gravelly texture; slope.	Severe: gravelly texture; slope.
Severe: less than 72 inches deep to porous sand and gravel; slope.[2]	Severe: slope	Severe: slope	Severe: slope	Severe: gravelly texture; slope.
Severe: seasonally high water table 18 to 30 inches below surface.	Moderate: seasonally high water table 18 to 30 inches below surface; slope.	Slight	Moderate: seasonally high water table 18 to 30 inches below surface.	Moderate: seasonally high water table 18 to 30 inches below surface; slope.
Severe: seasonally high water table 18 to 30 inches below surface; slope.	Severe: seasonally high water table 18 to 30 inches below surface; slope.	Moderate: slope	Moderate: seasonally high water table 18 to 30 inches below surface; slope.	Severe: seasonally high water table 18 to 30 inches below surface; slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Severe: seasonally high water table less than 6 inches below surface; stoniness.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface; stoniness.	Severe: seasonally high water table less than 6 inches below surface; stoniness.
Severe: 20 to 40 inches deep to rippable bedrock; seasonal high water table 18 to 30 inches below surface.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Slight	Moderate: seasonally high water table 18 to 30 inches below surface.	Moderate: 20 to 40 inches deep to rippable bedrock; slope.
Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: slope	Moderate: slope	Severe: 20 to 40 inches deep to rippable bedrock; slope.
Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: slope	Severe: slope	Severe: 20 to 40 inches deep to rippable bedrock; slope.
Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings		Lawns and fairways
		With basements	Without basements	
Lima:				
LoA	Severe: slow permeability.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Slight
LoB	Severe: slow permeability.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Slight
LoC	Severe: slow permeability.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Moderate: slope	Moderate: slope
Lockport: LpB	Severe: seasonally high water table 6 to 18 inches below surface; 20 to 40 inches deep to rippable bedrocks; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 18 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 18 inches below surface; 20 to 40 inches deep to rippable bedrock.
Lyons: Ly	Seasonally high water table less than 6 inches below surface; slow or very slow permeability.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Manheim:				
McA	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
McB	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
McC	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.
Manlius:				
MlB	Severe: 20 to 40 inches deep to rippable bedrock.	Moderate: 20 to 40 inches deep to rippable bedrock.	Slight	Slight
MlC	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: slope	Moderate: slope
MlD	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: slope	Severe: slope
Massena: MnB	Severe: seasonally high water table less than 12 inches below surface; slow permeability.	Severe: seasonally high water table less than 12 inches below surface.	Severe: seasonally high water table less than 12 inches below surface.	Severe: seasonally high water table less than 12 inches below surface.
Mohawk:				
MoB	Severe: 40 to 60 inches deep to rippable bedrock; slow permeability.	Moderate: seasonally high water table 24 to 30 inches below surface in places.	Slight	Slight
MoC	Severe: 40 to 60 inches deep to rippable bedrock; slow permeability.	Moderate: slope	Moderate: slope	Moderate: slope

See footnotes at end of table.

the soils for town and country planning—Continued

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface.
Severe: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.
Severe: seasonally high water table 18 to 24 inches below surface; slope.	Severe: seasonally high water table 18 to 24 inches below surface; slope.	Moderate: slope	Moderate: seasonally high water table 18 to 24 inches below surface; slope.	Severe: seasonally high water table 18 to 24 inches below surface; slope.
Severe: seasonally high water table 6 to 18 inches below surface; 20 to 40 inches deep to rippable bedrock.	Severe: seasonally high water table 6 to 18 inches below surface; 20 to 40 inches deep to rippable bedrock.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; 20 to 40 inches deep to rippable bedrock.
Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; slope.
Severe: seasonally high water table 6 to 18 inches below surface; slope.	Severe: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Severe: seasonally high water table 6 to 18 inches below surface; slope.	Severe: seasonally high water table 6 to 18 inches below surface; slope.
Severe: 20 to 40 inches deep to rippable bedrock.	Severe: 20 to 40 inches deep to rippable bedrock.	Slight	Moderate: shaly texture.	Severe: shaly texture.
Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: slope	Moderate: slope	Severe: shaly texture; slope.
Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: slope	Severe: slope	Severe: shaly texture; slope.
Severe: seasonally high water table less than 12 inches below surface.	Severe: seasonally high water table less than 12 inches below surface.	Severe: seasonally high water table less than 12 inches below surface.	Severe: seasonally high water table less than 12 inches below surface.	Severe: seasonally high water table less than 12 inches below surface.
Severe: 40 to 60 inches deep to rippable bedrock; seasonally high water table 24 to 30 inches below surface in places.	Moderate: 40 to 60 inches deep to rippable bedrock; slope.	Slight	Slight	Moderate: slope.
Severe: 40 to 60 inches deep to rippable bedrock; slope.	Severe: 40 to 60 inches deep to rippable bedrock; slope.	Moderate: slope	Moderate: slope	Severe: slope.

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings		Lawns and fairways
		With basements	Without basements	
Mohawk—Continued				
MoD	Severe: 40 to 60 inches deep to rippable bedrock; slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Mosherville: MsB	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
Nassau:				
NaB	Severe; less than 20 inches deep to rippable bedrock.	Severe: less than 20 inches deep to rippable bedrock.	Moderate: less than 20 inches deep to rippable bedrock.	Severe; less than 20 inches deep to rippable bedrock.
NaC	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Moderate: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.
NaD	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.
Ontario:				
OnB	Severe: very slow or slow permeability.	Slight	Slight	Slight
OnC	Severe: very slow or slow permeability; slope.	Moderate: slope	Moderate: slope	Moderate: slope
OnD	Severe: very slow or slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Palatine:				
PaB	Severe: 20 to 40 inches deep to rippable bedrock.	Moderate: 20 to 40 inches deep to rippable bedrock.	Slight	Moderate: 20 to 40 inches deep to rippable bedrock.
PaC	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: slope	Moderate: 20 to 40 inches deep to rippable bedrock; slope.
PaD	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: slope	Severe: 20 to 40 inches deep to rippable bedrock; slope.
Palms: Pk	Severe: water table on or near surface.	Severe: water table on or near surface.	Severe: water table on or near surface.	Severe: water table on or near surface.
Palmyra:				
PlA	Slight [2]	Slight	Slight	Moderate: gravelly texture.
PlB	Slight [2]	Slight	Slight	Moderate: gravelly texture.
PlC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Moderate: gravelly texture; slope.
Palmyra and Howard:				
PmC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Moderate: gravelly texture; slope.
PmF	Severe: slope [2]	Severe: slope	Severe: slope	Severe: slope
Phelps: PpB	Moderate: seasonally high water table 18 to 24 inches below surface.[2]	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Moderate: gravelly texture.

See footnotes at end of table.

the soils for town and country planning—Continued

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: 40 to 60 inches deep to rippable bedrock; slope.	Severe: 40 to 60 inches deep to rippable bedrock; slope.	Severe: slope.	Severe: slope.	Severe: slope.
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; slope.
Severe: less than 20 inches deep to rippable bedrock.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock.	Severe: less than 20 inches deep to rippable bedrock.	Severe: less than 20 inches deep to rippable bedrock; slope.
Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.
Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.	Severe: less than 20 inches deep to rippable bedrock; slope.
Slight.	Moderate: slope.	Slight.	Slight.	Moderate: slope.
Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.
Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Severe: 20 to 40 inches deep to rippable bedrock.	Severe: 20 to 40 inches deep to rippable bedrock.	Slight.	Slight.	Severe: 20 to 40 inches deep to rippable bedrock; slope.
Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Moderate: slope.	Moderate: slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.
Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.	Severe: slope.	Severe: slope.	Severe: 20 to 40 inches deep to rippable bedrock; slope.
Severe: water table on or near surface.	Severe: water table on or near surface.	Severe: water table on or near surface.	Severe: water table on or near surface.	Severe: water table on or near surface.
Severe: less than 72 inches deep to porous sand and gravel.[2]	Slight.	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture.
Severe: less than 72 inches deep to porous sand and gravel.[2]	Moderate: slope.	Moderate: gravelly texture.	Moderate: gravelly texture.	Severe: gravelly texture; slope.
Severe: less than 72 inches deep to porous sand and gravel; slope.[2]	Severe: slope.	Moderate: gravelly texture; slope.	Moderate: gravelly texture; slope.	Severe: gravelly texture; slope.
Severe: less than 72 inches deep to porous sand and gravel; slope.[2]	Severe: slope.	Moderate: gravelly texture; slope.	Moderate: gravelly texture; slope.	Severe: gravelly texture; slope.
Severe: less than 72 inches deep to porous sand and gravel; slope.[2]	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Severe: seasonally high water table 18 to 24 inches below surface; less than 72 inches deep to porous sand and gravel.[2]	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: gravelly texture.	Moderate: gravelly texture; seasonally high water table 18 to 24 inches below surface.	Severe: gravelly texture; seasonally high water table 18 to 24 inches below surface.

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings		Lawns and fairways
		With basements	Without basements	
Raynham: RaB	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
Rhinebeck:				
RbA	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
RbB	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.	Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.
Rough broken land: Ro.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Sandstone rock land: Sa.	Severe: bedrock on or near the surface.	Severe: bedrock on or near the surface.	Moderate: bedrock on or near the surface.	Severe: bedrock on or near the surface.
Shaly rock land: ShF	Severe: less than 20 inches deep to bedrock; slope.	Severe: slope	Severe: slope	Severe: slope
Sun: Sm	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Teel: Te, Ts	Severe: floods once in 2 to 5 years; seasonally high water table 12 to 24 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table 12 to 24 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table 12 to 24 inches below surface.	Moderate: floods once in 2 to 5 years.
Wassaic:				
WaA	Severe: 20 to 40 inches deep to bedrock.	Severe: 20 to 40 inches deep to bedrock.	Moderate: 20 to 40 inches deep to bedrock.	Moderate: 20 to 40 inches deep to bedrock.
WaB	Severe: 20 to 40 inches deep to bedrock.	Severe: 20 to 40 inches deep to bedrock.	Moderate: 20 to 40 inches deep to bedrock.	Moderate: 20 to 40 inches deep to bedrock.
WaC	Severe: 20 to 40 inches deep to bedrock; slope.	Severe: 20 to 40 inches deep to bedrock; slope.	Moderate: 20 to 40 inches deep to bedrock; slope.	Moderate: 20 to 40 inches deep to bedrock; slope.
WaD	Severe: 20 to 40 inches deep to bedrock; slope.	Severe: 20 to 40 inches deep to bedrock; slope.	Severe: 20 to 40 inches deep to bedrock; slope.	Severe: 20 to 40 inches deep to bedrock; slope.
Wayland: Wd	Severe: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.	Moderate: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.
Williamson:				
WlA	Severe: slow permeability; seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Slight
WlB	Severe: slow permeability; seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Slight

See footnotes at end of table.

the soils for town and country planning—Continued

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.
Severe: seasonally high water table 6 to 18 inches below surface; silty clay subsoil.	Moderate: seasonally high water table 6 to 18 inches below surface.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; slow permeability.
Severe: seasonally high water table 6 to 18 inches below surface; silty clay subsoil.	Moderate: seasonally high water table 6 to 18 inches below surface; slope.	Moderate: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface.	Severe: seasonally high water table 6 to 18 inches below surface; slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: bedrock on or near the surface.	Severe: bedrock on or near the surface.	Severe: bedrock on or near the surface.	Severe: bedrock on or near the surface.	Severe: bedrock on or near the surface.
Severe: less than 20 inches deep to bedrock; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.	Severe: seasonally high water table less than 6 inches below surface.
Severe: floods once in 2 to 5 years; seasonally high water table 12 to 24 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table 12 to 24 inches below surface.	Moderate: floods once in 2 to 5 years.	Severe: floods once in 2 to 5 years; seasonally high water table 12 to 24 inches below surface.	Moderate: floods once in 2 to 5 years; seasonally high water table 12 to 24 inches below surface.
Severe: 20 to 40 inches deep to bedrock.	Severe: 20 to 40 inches deep to bedrock.	Slight	Slight	Severe: 20 to 40 inches deep to bedrock.
Severe: 20 to 40 inches deep to bedrock.	Severe: 20 to 40 inches deep to bedrock.	Slight	Slight	Severe: 20 to 40 inches deep to bedrock; slope.
Severe: 20 to 40 inches deep to bedrock; slope.	Severe: 20 to 40 inches deep to bedrock; slope.	Moderate: slope	Moderate: slope	Severe: 20 to 40 inches deep to bedrock; slope.
Severe: 20 to 40 inches deep to bedrock; slope.	Severe: 20 to 40 inches deep to bedrock; slope.	Severe: slope	Severe: slope	Severe: 20 to 40 inches deep to bedrock; slope.
Severe: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.	Moderate: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.	Severe: floods once in 2 to 5 years; seasonally high water table less than 12 inches below surface.
Severe: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slow permeability.
Severe: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface.	Slight	Moderate: seasonally high water table 18 to 24 inches below surface.	Moderate: seasonally high water table 18 to 24 inches below surface; slope.

525-444—75——8

TABLE 7.—*Estimated degree and kind of limitation of*

Series and map symbols	Disposal of septic tank effluent	Homesites and low buildings		Lawns and fairways
		With basements	Without basements	
Windsor:				
WnA	Slight [2]	Slight	Slight	Severe: loamy fine sand texture.
WnB	Slight [2]	Slight	Slight	Severe: loamy fine sand texture.
WnC	Moderate: slope [2]	Moderate: slope	Moderate: slope	Severe: loamy fine sand texture; slope.

[1] Onsite deep studies of the underlying strata and water table and determination of the hazard of aquifer pollution and drainage into ground water need to be made for landfills deeper than 5 or 6 feet.
[2] Possible pollution hazard to lakes, streams, springs, or shallow wells.

considered in this rating. The main soil characteristics considered were depth to seasonal high water table, permeability, slope, depth to bedrock, surface rockiness, surface stoniness, surface soil texture, and flooding hazard. Well drained to moderately well drained, deep and moderately deep soils that are nearly level to gently sloping are best suited to campsites.

Athletic fields.—This rating is for the use of the soil for the development of baseball, football, soccer, or similar athletic fields. It is assumed that finished areas are nearly level and subject to heavy foot traffic. Importation of fill material or topsoil was not considered in the ratings. Soil properties considered in determining limitations for athletic fields were depth to seasonal high water table, permeability, slope, depth to bedrock, surface rockiness, surface stoniness, surface soil texture, and flooding hazard.

Descriptions of the Soils

This section describes the soil series and mapping units in Herkimer County, Southern Part. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are important in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Alluvial land, for example, does not belong to a soil series, but nevertheless is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and woodland suitability group in which the mapping unit has been placed. The page for the description of each capability unit and woodland suitability group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 8. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*10*).

Agawam Series

The Agawam series consists of deep, well-drained, medium-textured soils that formed in sandy stream terrace or lacustrine deposits. In Herkimer County the Agawam soils are mapped only as a soil complex with Hartland soils. Agawam soils are gently sloping to moderately steep and are only in the northeastern part of the survey area. They are medium to low in lime.

In a representative profile the surface layer is brown to dark-brown very fine sandy loam about 11 inches thick. The upper part of the subsoil is strong-brown, very friable fine sandy loam about 6 inches thick. It is neutral, and at a depth of about 17 inches merges with the brown to dark-brown, friable fine sandy loam lower part of the subsoil. The lower part of the subsoil is neutral and extends to a depth of about 30 inches. The substratum just below is brown to dark-brown, very friable, neutral loamy fine sand that extends to a depth of 50 or more inches.

the soils for town and country planning—Continued

Sanitary landfills [1]	Streets and parking lots	Play and picnic areas	Campsites	Athletic fields
Severe: rapid permeability.[2]	Slight	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.
Severe: rapid permeability.[2]	Moderate: slope	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture.	Moderate: loamy fine sand texture; slope.
Severe: rapid permeability.[2]	Severe: slope	Moderate: loamy fine sand texture; slope.	Moderate: loamy fine sand texture; slope.	Severe: loamy fine sand texture; slope.

The water table in Agawam soils is generally below a depth of 42 inches. Maximum rooting depth is not limited. Permeability is moderately rapid in the subsoil and rapid below. Available water capacity in these soils is high. Available potassium and phosphorus are low, and available nitrogen is medium. Agawam soils generally need lime when growing legumes.

Representative profile of Agawam very fine sandy loam from an area of Hartland-Agawam complex, 8 to 15 percent slopes, in a hayfield in town of Salisbury, 1.2 miles southwest of Salisbury Center, 284 feet south of Shedd Road:

Ap—0 to 11 inches, brown to dark-brown (10YR 4/3), pale-brown (10YR 6/3) dry, very fine sandy loam; weak, medium and fine, granular structure; very friable; many fine roots; few medium pores; less than 1 percent cobblestones; neutral (soil has been limed); abrupt, smooth boundary.

B21—11 to 17 inches, strong-brown (7.5YR 5/6), brownish-yellow (10YR 6/6) dry, fine sandy loam; weak, medium, subangular blocky structure; very friable; many fine roots; common medium pores; some tonguing of B21 into B22; small accumulation of very dark grayish-brown (10YR 3/2) organic matter at the top of the B2 horizon; less than 1 percent cobblestones; neutral; gradual, broken boundary.

B22—17 to 30 inches, brown to dark-brown (10YR 4/3), pale-brown (10YR 6/3) dry, fine sandy loam; weak, coarse, subangular blocky structure; friable; few fine roots; few medium pores; less than 1 percent cobblestones; neutral; gradual, wavy boundary.

C—30 to 50 inches, brown to dark-brown (10YR 4/3), light brownish-gray (10YR 6/2) dry, loamy fine sand; single grained; very friable; few fine roots; thin lenses of fine sand and silt; scattered soft shale chips; less than 1 percent cobblestones; neutral.

The solum ranges from 18 to 35 inches in thickness. Rounded gravel in many places is absent, but ranges to 10 percent in some profiles. Reaction in the solum and substratum is medium acid to neutral, depending on liming practices. The Ap horizon is dominantly dark brown in color. It has a moist value of 3 or 4; chroma is 2 to 4. Hue is 10YR or 2.5Y. The Ap horizon is very fine sandy loam or loam.

The B21 horizon ranges from 5YR to 10YR in hue, and the redder hues are discontinuous through the profile. Color values are 4 or 5; chroma is 4 to 6. The B21 horizon is sandy loam to loam. The B22 horizon has hues ranging from 10YR to 2.5Y, and values from 4 to 6. Chroma is 3 or 4. The B22 horizon is sandy loam to fine sandy loam. It has weak, subangular blocky structure or is structureless.

The C horizon has hues ranging from 10YR to 5Y, and values of 3 to 6. Chroma is 2 to 4. The C horizon is fine sand to loamy fine sand, and contains thin lenses of silt in places.

The reaction of some of these soils is less acid than is defined as the range for the series, but this difference does not alter their usefulness or behavior.

Agawam soils are very closely associated with Hartland soils. In Herkimer County, they are mapped only in a complex with Hartland soils. Agawam soils contain less silt in the top 40 inches than Hartland soils. Agawam soils are also near Williamson, Windsor, and Howard soils. They are less silty, lack the fragipan, and are better drained than Williamson soils. They have finer textured B horizons than Windsor soils and lack the gravelly solum of Howard soils.

Allis Series

The Allis series consists of moderately deep, poorly drained to somewhat poorly drained soils that have a moderately fine textured to fine textured subsoil. They are on uplands and are nearly level or are in small depressions. Allis soils formed in till deposits or semi-residual material derived mainly from underlying acid shale. Bedrock begins at depth of 20 to 40 inches. The soils are low or very low in lime.

In a representative profile the surface layer is dark yellowish-brown silt loam about 5 inches thick. It is medium acid and has a few shale fragments. The upper part of the subsoil is mottled, dark grayish-brown, firm silty clay loam that extends to a depth of about 10 inches. It is medium acid and has a few shale fragments. The lower part of the subsoil is prominently mottled, gray, firm silty clay about 13 inches thick. It is medium acid, firm when moist, plastic when wet, and has 10 percent shale fragments. Dark grayish-brown, partly weathered shale bedrock begins at a depth of about 23 inches. It is medium acid and thinly bedded.

The water table is perched above the slowly permeable subsoil and is at or near the surface in spring and during prolonged wet periods. The high water table and shale bedrock restrict root growth mainly to the upper 15 inches. Available water capacity is moderate to low. Available potassium and phosphorus are medium, and available nitrogen is medium to high. If farmed, these soils should be limed.

TABLE 8.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Allis silt loam	750	0. 2
Alluvial land	8, 950	2. 7
Appleton silt loam, 0 to 3 percent slopes	2, 775	. 8
Appleton silt loam, 3 to 8 percent slopes	6, 910	2. 0
Appleton and Manheim very stony silt loams, 0 to 8 percent slopes	2, 305	. 7
Bombay very fine sandy loam, 3 to 8 percent slopes	1, 045	. 3
Bombay very fine sandy loam, 8 to 15 percent slopes	795	. 2
Broadalbin loam, 2 to 8 percent slopes	5, 375	1. 7
Broadalbin loam, 8 to 15 percent slopes	2, 585	. 8
Broadalbin loam, 15 to 25 percent slopes	690	. 2
Broadalbin and Lansing extremely stony soils, 0 to 25 percent slopes	1, 850	. 5
Burdett silt loam, 0 to 3 percent slopes	1, 070	. 3
Burdett silt loam, 3 to 8 percent slopes	8, 435	2. 6
Burdett silt loam, 8 to 15 percent slopes	1, 900	. 6
Canton stony very fine sandy loam, 2 to 8 percent slopes	730	. 2
Canton stony very fine sandy loam, 8 to 15 percent slopes	700	. 2
Carlisle muck	3, 700	1. 1
Cohoctah mucky very fine sandy loam	1, 850	. 5
Conesus silt loam, 2 to 8 percent slopes	11, 285	3. 3
Cut and fill land	3, 725	1. 1
Farmington silt loam, 0 to 8 percent slopes	4, 135	1. 2
Farmington very rocky silt loam, 0 to 25 percent slopes	2, 940	. 9
Farmington-Rock land complex, steep	1, 710	. 5
Fredon fine sandy loam	2, 280	. 7
Fresh water marsh	315	. 1
Halsey soils	2, 025	. 6
Hamlin fine sandy loam	1, 320	. 4
Hamlin silt loam	1, 110	. 3
Hartland-Agawam complex, 3 to 8 percent slopes	660	. 2
Hartland-Agawam complex, 8 to 15 percent slopes	655	. 2
Hartland-Agawam complex, 15 to 25 percent slopes	345	. 1
Herkimer gravelly silt loam, 0 to 3 percent slopes	2, 615	. 8
Herkimer gravelly silt loam, 3 to 8 percent slopes	1, 785	. 5
Herkimer gravelly silt loam, moderately well drained, 0 to 4 percent slopes	2, 100	. 6
Hilton silt loam, 3 to 8 percent slopes	2, 090	. 6
Hilton silt loam, 8 to 15 percent slopes	2, 925	. 9
Hinckley gravelly loamy sand, 0 to 3 percent slopes	1, 520	. 4
Hinckley gravelly loamy sand, 3 to 8 percent slopes	2, 815	. 8
Hinckley gravelly loamy sand, 8 to 15 percent slopes	1, 975	. 6
Hinckley and Windsor soils, 15 to 25 percent slopes	1, 905	. 5
Hinckley and Windsor soils, 25 to 70 percent slopes	5, 135	1. 5
Honeoye silt loam, 3 to 8 percent slopes	13, 195	3. 9
Honeoye silt loam, 8 to 15 percent slopes	9, 725	2. 9
Honeoye silt loam, 15 to 25 percent slopes	6, 005	1. 8
Honeoye and Lansing silt loams, 25 to 35 percent slopes	9, 165	2. 8
Honeoye and Mohawk very stony silt loams, 0 to 25 percent slopes	1, 840	. 5
Hornell silt loam, 0 to 3 percent slopes	780	. 2
Hornell silt loam, 3 to 8 percent slopes	4, 140	1. 3
Hornell silt loam, 8 to 15 percent slopes	2, 060	. 6
Howard gravelly fine sandy loam, 0 to 3 percent slopes	1, 510	. 4
Howard gravelly fine sandy loam, 3 to 8 percent slopes	2, 105	0. 6
Howard gravelly fine sandy loam, 8 to 15 percent slopes	640	. 2
Howard gravelly silt loam, 0 to 3 percent slopes	1, 045	. 3
Howard gravelly silt loam, 3 to 8 percent slopes	2, 150	. 6
Howard gravelly silt loam, 8 to 15 percent slopes	1, 085	. 3
Howard and Palmyra soils, 15 to 25 percent slopes	1, 370	. 4
Hudson silt loam, loamy substratum, 2 to 8 percent slopes	2, 525	. 7
Hudson silt loam, loamy substratum, 8 to 15 percent slopes	1, 190	. 3
Hudson silt loam, loamy substratum, 15 to 30 percent slopes	830	. 2
Ilion silt loam	9, 115	2. 7
Ilion and Sun very stony silt loams	885	. 3
Lairdsville silt loam, loamy subsoil variant, 3 to 8 percent slopes	640	. 2
Lairdsville silt loam, loamy subsoil variant, 8 to 15 percent slopes	585	. 2
Lairdsville silt loam, loamy subsoil variant, 15 to 25 percent slopes	495	. 1
Lamson mucky silt loam	335	. 1
Lansing silt loam, 8 to 15 percent slopes	10, 950	3. 3
Lansing silt loam, 15 to 25 percent slopes	5, 860	1. 7
Lima silt loam, 0 to 3 percent slopes	1, 585	. 5
Lima silt loam, 3 to 8 percent slopes	6, 345	1. 9
Lima silt loam, 8 to 15 percent slopes	1, 235	. 4
Lockport silt loam, loamy subsoil variant, 0 to 4 percent slopes	520	. 2
Lyons mucky silt loam	4, 040	1. 3
Manheim silt loam, 0 to 3 percent slopes	3, 265	. 9
Manheim silt loam, 3 to 8 percent slopes	19, 305	5. 7
Manheim silt loam, 8 to 15 percent slopes	3, 515	1. 0
Manlius shaly silt loam, 3 to 8 percent slopes	785	. 2
Manlius shaly silt loam, 8 to 15 percent slopes	1, 485	. 4
Manlius shaly silt loam, 15 to 25 percent slopes	2, 525	. 7
Massena very fine sandy loam, 0 to 8 percent slopes	1, 005	. 3
Mohawk silt loam, shale substratum, 3 to 8 percent slopes	6, 590	1. 9
Mohawk silt loam, shale substratum, 8 to 15 percent slopes	7, 120	2. 0
Mohawk silt loam, shale substratum, 15 to 25 percent slopes	3, 985	1. 2
Mosherville very fine sandy loam, 2 to 8 percent slopes	2, 315	. 7
Nassau silt loam, 3 to 8 percent slopes	740	. 2
Nassau silt loam, 8 to 15 percent slopes	1, 185	. 3
Nassau silt loam, 15 to 25 percent slopes	1, 775	. 5
Ontario silt loam, 3 to 8 percent slopes	530	. 2
Ontario silt loam, 8 to 15 percent slopes	835	. 2
Ontario silt loam, 15 to 25 percent slopes	1, 830	. 5
Palatine silt loam, 2 to 8 percent slopes	660	. 2
Palatine silt loam, 8 to 15 percent slopes	370	. 1
Palatine silt loam, 15 to 25 percent slopes	245	(1)
Palms muck	1, 595	. 5
Palmyra gravelly silt loam, 0 to 3 percent slopes	1, 260	. 4
Palmyra gravelly silt loam, 3 to 8 percent slopes	2, 015	. 6
Palmyra gravelly silt loam, 8 to 15 percent slopes	415	. 1
Palmyra and Howard soils, rolling	1, 755	. 5
Palmyra and Howard soils, 25 to 70 percent slopes	2, 675	. 8
Phelps gravelly fine sandy loam, 0 to 4 percent slopes	2, 260	. 7

See footnote at end of table.

TABLE 8.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Raynham silt loam, 0 to 4 percent slopes	980	0.3	Wayland silt loam	1,705	0.5
Rhinebeck silt loam, loamy substratum, 0 to 3 percent slopes	1,570	.5	Williamson silt loam, 0 to 3 percent slopes	300	.1
Rhinebeck silt loam, loamy substratum, 3 to 8 percent slopes	2,765	.8	Williamson silt loam, 3 to 8 percent slopes	495	.1
Rough broken land	16,865	5.0	Windsor loamy fine sand, 0 to 3 percent slopes	365	.1
Sandstone rock land	990	.3	Windsor loamy fine sand, 3 to 8 percent slopes	1,005	.3
Shaly rock land, very steep	7,610	2.2	Windsor loamy fine sand, 8 to 15 percent slopes	770	.2
Sun mucky silt loam	2,325	.7	Water	2,820	.8
Teel fine sandy loam	395	.1	Gravel pit	365	.1
Teel silt loam	2,030	.6	Quarry	140	(1)
Wassaic silt loam, 0 to 3 percent slopes	1,770	.5	Dump	5	(1)
Wassaic silt loam, 3 to 8 percent slopes	6,685	2.0	Blowout	100	(1)
Wassaic silt loam, 8 to 15 percent slopes	1,795	.5	Total acres in area mapped	340,300	100.0
Wassaic silt loam, 15 to 25 percent slopes	675	.2			

[1] Less than 0.1 percent.

Representative profile of Allis silt loam, in a pasture in town of Warren, 1/4 mile south of junction of Millstone and Tunnicliff Roads:

Ap—0 to 5 inches, dark yellowish-brown (10YR 3/4) silt loam; weak, medium, granular structure; friable; many fine roots; 5 percent shale fragments; medium acid; clear, smooth boundary.

B21g—5 to 10 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; many, medium, prominent, yellowish-brown (10YR 5/6 and 5/8) mottles; ped faces are dark grayish brown (2.5Y 4/2); moderate, medium, platy structure parting to moderate, fine, subangular blocky; firm; few fine roots; 5 percent shale fragments; medium acid; clear, smooth boundary.

B22g—10 to 23 inches, gray (N 5/10) silty clay; many, coarse, prominent, yellowish-brown (10YR 5/8) mottles; ped faces are gray (5Y 5/1); moderate, coarse, subangular blocky structure; firm, plastic when wet; 10 percent shale fragments; medium acid; clear, smooth boundary.

R—23 inches, dark grayish-brown (2.5Y 4/2) partly weathered shale; medium acid.

The solum ranges from 20 to 36 inches in thickness. The depth to bedrock ranges from 20 to 40 inches. Reaction is strongly acid to medium acid. Coarse fragments range from 5 to 20 percent in the profile. The hue ranges from 10YR to 5Y. The colors are neutral in the B horizon in many places. The A horizon has color values of 3 or 4; chroma is 2 to 4. The B horizon is heavy silty clay loam and silty clay. It has color values of 4 to 6; chroma is 0 to 2. Mottles are distinct and prominent; chroma is 4 to 8. A thin C horizon separates the solum from the shale bedrock in some of the deeper profiles. In places the bedrock contains thin strata of sandstone, but in most places it is weathered, acid, fissile shale.

The reaction of some of these soils is less acid than is defined as the range for the series. Also, the chroma is lower in some profiles because of the influence of dark-colored shale. These differences do not alter the usefulness or behavior of the soils.

Allis soils are closely associated with somewhat poorly drained to moderately well drained Hornell soils, which formed in similar material and which are also moderately deep over shale. Allis soils are also near the deeper, poorly drained Ilion soils. They generally have a finer textured B horizon than Ilion soils and are more acid.

Allis silt loam (Aa).—This nearly level soil is on bedrock-controlled uplands. It is the only soil in this series mapped in the county. Individual areas are irregularly shaped and range from 3 to 25 acres. Slopes are less than 4 percent. Acid shale bedrock begins at depths ranging from 20 to 40 inches.

Included with this soil in mapping were small areas of Hornell soils on the higher, better drained positions; a few spots of deeper Ilion silt loam; and some small spots of soils that have a silty subsoil instead of a clayey subsoil. In addition, small areas were included that have a silty clay loam surface layer.

Excess water and the moderate depth to shale bedrock limit the use of this soil for crops. The soil is suited to hay or pasture plants and to shallow-rooted trees that are tolerant of wetness. The moderate depth to bedrock makes drainage difficult. In areas that can be drained, however, the soil is suited to crops if properly fertilized according to soil tests, and if the soil does not dry out during the growing season. Capability unit IVw-2; woodland suitability group 5w1.

Alluvial Land

Alluvial land (Ad) consists of nearly level areas of unconsolidated alluvium, generally stratified, and varying widely in texture and drainage over short distances. The alluvium has been recently deposited by streams and is subject to frequent changes through stream overflow. It is in long, narrow areas on flood plains that range from about 3 to 20 acres.

Included with this land type in mapping were small areas of alluvial soils such as the well-drained Hamlin soils, the moderately well drained to somewhat poorly drained Teel soils, the poorly to very poorly drained Wayland soils, and the very poorly drained Cohoctah soils.

Some Alluvial land has remained in place long enough for plants to become established; other areas are so gravelly or cobbly that they support little or no vegetation.

Alluvial land floods frequently and is poorly suited to farming. It provides some pasture in places but is usually very difficult to manage. Much of it is idle. Capability unit and woodland suitability group not assigned.

Appleton Series

The Appleton series consists of deep, somewhat poorly drained, medium-textured soils that formed in calcareous glacial till derived mainly from local sandstone and limestone. These soils are nearly level to gently sloping and are on upands having slow runoff or on areas that receive runoff. They are high in lime.

In a representative profile the surface layer is very dark grayish-brown silt loam that contains a few gravelly fragments and is about 8 inches thick. It is underlain by a leached subsurface layer of mottled grayish-brown, friable silt loam about 4 inches thick that is neutral and contains a few gravelly fragments. At a depth of 12 inches it merges with the upper part of the subsoil, which is firm gravelly silt loam about 8 inches thick. The upper part of the subsoil ranges from mottled dark grayish brown to dark brown in color and is neutral in reaction. Below a depth of 20 inches, the lower part of the subsoil is dark grayish-brown, firm gravelly loam that is mildly alkaline. The calcareous substratum begins at a depth of 27 inches and extends to a depth of 50 or more inches. It is dark grayish-brown, firm gravelly sandy loam.

In the spring and during wet periods, the water table is perched on the moderately slowly permeable subsoil and dense-till substratum. If undrained, the water table is at a depth of 6 to 8 inches in places. During dry periods it falls to depths below 25 inches. The depth of rooting is strongly influenced by the water table. In spring rooting is confined to the upper 8 to 10 inches, and as the season progresses it extends to depths of 20 to 25 inches. Few roots are encountered below these depths. Available water capacity is moderate to high. Water runs off these soils slowly, or the soils receive considerable moisture from adjacent soils. Available nitrogen is high, but it is released very slowly in the spring. Available potassium is medium to high, and available phosphorus is medium. Some areas need no lime, while others are slightly acid and need to be limed when growing legumes.

Representative profile of Appleton silt loam, 0 to 3 percent slopes, in a meadow in town of Columbia, 100 feet north of Jordanville Road, and 0.1 mile west of the intersection of Jordanville and Hugick Roads:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2), light brownish-gray (2.5Y 6/2) dry, silt loam; weak, medium and fine, subangular blocky structure; friable; many fine and medium roots; common medium and fine pores; 10 percent gravel; neutral; gradual, smooth boundary.

A2—8 to 12 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and fine, subangular blocky structure; friable; many medium and fine roots; common medium pores; few worm casts; 10 percent gravel; neutral; gradual, wavy boundary.

B21t—12 to 20 inches, gravelly silt loam that has dark grayish-brown (10YR 4/2) ped faces; brown to dark-brown (10YR 4/3) ped interiors; few, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; firm; few medium roots; common medium pores; patchy clay films on ped surfaces; 30 percent gravel; neutral; gradual, wavy boundary.

B22t—20 to 27 inches, dark grayish-brown (10YR 4/2) gravelly loam; weak, medium and coarse, subangular blocky structure; firm; few medium roots; few medium pores; 30 percent gravel; patchy clay films on ped faces and in pores; mildly alkaline; gradual, wavy boundary.

C—27 to 50 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam; massive; firm; 35 percent gravel; calcareous; moderately alkaline.

The solum ranges from 20 to 35 inches in thickness. Depth to free carbonates ranges from 18 to 30 inches. Coarse fragments, including stone-sized fragments, are less than 35 percent within depths of 40 inches, and may range up to 70 percent below 40 inches. Hue in the solum and substratum ranges from 5YR to 2.5Y.

The Ap or A1 horizon has color values ranging from 3 to 5; chroma is 2 or 3. This horizon ranges from weak, granular to weak, subangular blocky in structure. Reaction is slightly acid to neutral. The A2 horizon is silt loam to loam, and has color values of 4 to 6. Chroma is 2 to 4. It ranges from weak, granular to weak, subangular blocky in structure and is slightly acid to neutral. The A2 material commonly interfingers into the B21t horizon.

The B2t horizon is heavy loam or silt loam. It has color values of 3 to 6; chroma is 2 or 3. This horizon is generally mottled in some part of the upper 30 inches. The B2t horizon ranges from weak to moderate, angular or subangular blocky in structure and is friable to firm. Reaction is neutral to mildly alkaline.

The C horizon is sandy loam to silt loam. It has color values of 3 to 6; chroma is 1 to 3. It is moderately alkaline and calcareous.

Soils often near Appleton soils that formed in similar material are the well-drained Ontario, Honeoye, and Lansing soils, the moderately well drained Hilton, Lima, and Conesus soils, and the poorly drained and very poorly drained Lyons soils. Appleton soils are comparable in drainage to similar Massena, Manheim, and Burdett soils. They have finer textured B horizons than Massena soils, lack the dark-colored shale content of Manheim soils, and lack the silty mantle more than 13 inches thick that is characteristic of Burdett soils.

Appleton silt loam, 0 to 3 percent slopes (ApA).—This level to nearly level soil is on foot slopes and depressional areas adjacent to better drained soils from which it receives runoff. Individual areas are irregularly shaped and range from 5 to 30 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were spots of Lima and Hilton soils on the higher, better drained positions, and wetter Lyons soils in low spots and along drainageways. Also included were some areas west of the village of Frankfort that have a slightly brittle layer in the subsoil and are more acid. In the towns of Litchfield, Winfield, Columbia, and Warren, a few spots were included that are moderately shallow to limestone bedrock.

This somewhat poorly drained soil is suited to most crops grown in the county and pasture or trees. Unless it is drained, the choice of crops is restricted. Adequate drainage, proper fertilization according to soil tests, and applications of lime are necessary. Capability unit IIIw-1; woodland suitability group 3w1.

Appleton silt loam, 3 to 8 percent slopes (ApB).—This gently sloping soil has a profile similar to the one described as representative for the series except that in places it has a thinner subsurface layer. It is on ridgetops or foot slopes adjacent to more strongly sloping, better drained soils. Individual areas are irregularly shaped and range from 5 to 30 acres.

Included with this soil in mapping were spots of Lima and Hilton soils on the higher, better drained positions, and wetter Lyons soils in low spots and along drainageways. Also included were areas in the town of Frankfort that have a slightly brittle layer in the subsoil and are more acid.

This somewhat poorly drained soil is suited to most crops grown in the county and to pasture or trees. Unless it is drained, the choice of crops is restricted. Adequate drainage, proper fertilization according to soil tests, and applications of lime are necessary. Capability unit IIIw-3; woodland suitability group 3w1.

Appleton and Manheim very stony silt loams, 0 to 8 percent slopes (AtB).—These very stony soils are level to gently sloping and occupy ridgetops and foot slopes where runoff is slow or water accumulates. Drainage is somewhat poor. Some areas consist only of Appleton soils; others consist wholly of Manheim soils; still other areas are made up of both soils. Each of these soils has a profile similar to the one described as representative for its respective series except that the surface layers are usually thinner and darker in color and large stones occupy about 1½ to 50 cubic yards per acre-foot of the surface.

Included with these soils in mapping were small areas of moderately well drained Conesus, Hilton, and Lima soils and well drained to moderately well drained Mohawk soils on convex knolls. Also included were small areas of wetter Lyons and Ilion soils in depressions and low areas, areas of soils that are similar to Appleton and Manheim soils except that they have a slightly brittle subsoil, and areas of soils that are less stony.

Stoniness prohibits the use of these soils for crops. These soils provide some native pasture and are suited to trees and to some types of recreational use. Capability unit VIIs-4; woodland suitability group 3w1.

Bombay Series

The Bombay series consists of deep, moderately well drained, medium-textured soils that formed in silty or loamy sorted deposits over medium to moderately coarse textured glacial till that is neutral to moderately alkaline in reaction. These soils are gently sloping to moderately sloping and are on uplands. They are medium to high in lime.

In a representative profile the surface layer is dark-brown very fine sandy loam about 10 inches thick, underlain by faintly mottled, dark yellowish-brown, friable very sandy loam that is medium acid and extends to a depth of about 16 inches. The subsoil is faintly mottled, very dark grayish-brown and dark yellowish-brown friable loam about 25 inches thick that contains some gravel and shale fragments and is neutral. The calcareous substratum begins at a depth of about 41 inches. It is mottled, dark grayish-brown, firm gravelly loam that extends to a depth of 52 inches or more.

In spring and during wet periods, a water table is within 18 to 24 inches of the surface in places. This water table is perched on the moderately slowly or slowly permeable substratum. Maximum rooting depth is mainly 24 inches early in the season. Few roots extend below this as the seasons progress. Available water capacity is moderate to high. Available potassium is low; phosphorus, medium to low; and nitrogen, medium. Lime is generally needed when growing legumes.

Representative profile of Bombay very fine sandy loam, 3 to 8 percent slopes, in a hayfield in town of Norway, ¾ mile south of Norway, 400 feet east of Elm Tree Road:

Ap—0 to 10 inches, dark-brown (10YR 3/3) rubbed and unrubbed, very fine sandy loam; moderate, medium and fine, granular structure; very friable; many roots; 7 percent gravel; medium acid; abrupt, smooth boundary.

B&A—10 to 16 inches, very fine sandy loam that has dark yellowish-brown (10YR 3/4) ped interiors, dark grayish-brown (10YR 4/2) ped faces; common, medium, faint yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common fine roots; 8 percent gravel; medium acid; clear, wavy boundary.

IIB2t—16 to 41 inches, very dark grayish-brown (10YR 3/2) and dark yellowish-brown (10YR 3/4) loam; few, medium, faint, dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; friable; common fine roots in upper part of horizon; common medium and large pores; patchy clay films on ped faces; many worm channels; 10 percent gravel and shale fragments; neutral; clear, wavy boundary.

IIC—41 to 52 inches, dark grayish-brown (2.5Y 4/2) gravelly loam; 40 percent medium, distinct, light olive-brown (2.5Y 5/4) mottles; weak, coarse, prismatic parting to weak, thick, platy structure; firm in place, friable when removed; 17 percent gravel and shale fragments; mildly alkaline.

The solum ranges from 30 to 45 inches in thickness. The upper horizons are either in glacial till or in surficial deposits ranging in texture from silt loam to very fine sandy loam over glacial till. Coarse fragments range from none to 10 percent in the surficial deposits, and from 10 to 35 percent in the glacial till. Hues range from 10YR to 2.5Y throughout the solum.

The Ap horizon has color values of 3 or 4; chroma is 2 or 3. Reaction in this horizon is strongly acid to neutral. An A2 horizon that is brown in color is present in some profiles.

The B&A horizon has color values of 3 to 5; chroma is 2 to 4. The texture is light silt loam to fine sandy loam.

The B2t horizon has values of 3 or 4; chroma is 2 to 4. The texture is loam to fine sandy loam. Reaction in this horizon is neutral to medium acid.

The C horizon has color value of 3 or 4; chroma is 2 to 4. The texture is loam to fine sandy loam. Reaction in this horizon is neutral to moderately alkaline. Discontinuous lenses and pockets of water-sorted fine earth as well as sandy material occasionally are in the substratum.

High-chroma mottles are in some profiles in the A2 and B&A horizons and are present in the B2t horizon. The C horizon is commonly highly mottled. Some Bombay soils in Herkimer County are darker in value and chroma and less acid than defined as the range for the series.

Bombay soils are closely associated with somewhat poorly drained Massena soils that formed in similar material. They are also near the well-drained Lansing and Broadalbin soils and the moderately well drained Conesus soils. Bombay soils have a less clayey B horizon than either Lansing or Conesus soils. They lack the fragipan of Broadalbin soils.

Bombay very fine sandy loam, 3 to 8 percent slopes (BoB).—This gently sloping soil is on convex areas and side slopes on uplands where some runoff water accumulates. Individual areas are irregularly shaped and range from 5 to 30 incres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small spots of better drained Lansing and Broadalbin soils, as well as areas areas of similar but finer textured Conesus soils. Also included were areas of wetter Massena soils in low areas where more water accumulates, and small areas that are stony.

This soil is suited to most crops grown in the county and to pasture or trees. Slight wetness in places delays planting briefly in spring. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. In places some removal of stones is needed for efficient use of machinery. At higher elevations the shorter growing season limits the varieties of some crops that can be grown successfully. Capability unit IIe-4; woodland suitability group 2o1.

Bombay very fine sandy loam, 8 to 15 percent slopes (BoC).—This moderately sloping soil is on side slopes on uplands where some runoff water accumulates. It has a profile similar to the one described as representative for the series except that in places it has thinner subsurface layers. Individual areas are irregularly shaped and range from 5 to 30 acres.

Included with this soil in mapping were small areas of better drained Lansing and Broadalbin soils, as well as similar but finer textured Conesus soils. Also included were small areas of wetter Massena soils in low spots, as well as some stony areas.

This soil is suited to most crops grown in the county and to pasture or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Slight wetness in places delays planting briefly in the spring. At the higher elevations, the shorter growing season limits the varieties of some crops that can be grown successfully. In places removal of stones is needed for efficient use of machinery. Capability unit IIIe-4; woodland suitability group 2o1.

Broadalbin Series

The Broadalbin series consists of deep, well drained and moderately well drained, medium-textured soils that have a fragipan. They formed in sorted silty or loamy deposits underlain by firm, medium or moderately coarse textured glacial till that is strongly acid to neutral. These soils are nearly level to moderately steep and are on uplands. They are very low to medium in lime.

In a representative profile in a cultivated area the surface layer is very dark grayish-brown loam about 8 inches thick. The upper part of the subsoil is very friable loam that is yellowish brown to a depth of 12 inches and brown below. It is slightly acid and extends to a depth of about 17 inches. The upper part of the subsoil is separated from the lower part by a thin leached layer of brown to light brownish-gray, loose loamy fine sand about one inch thick. The lower part of the subsoil is a firm, brittle fragipan at a depth of 18 inches. It is faintly mottled, dark grayish-brown and dark-brown to brown fine sandy loam that is medium acid. The fragipan extends to a depth of 34 inches, where it merges with a substratum of distinctly mottled, dark-brown fine sandy loam that is firm and medium acid and extends to a depth of 52 inches or more.

Seasonally, the water table is at depths of 18 to 30 inches. It is perched over the slowly permeable fragipan in spring and during wet periods. Maximum rooting depth is mainly in the 18- to 36-inch zone above the fragipan. Available water capacity is moderate to high. Available potassium and phosphorus are low, and available nitrogen is medium. Reaction in the surface layer of these soils is strongly acid to slightly acid in unlimed areas.

Representative profile of Broadalbin loam, 2 to 8 percent slopes, in a cultivated field in town of Russia, 3.0 miles northwest of Russia, 0.25 mile south of intersection of Black Creek and Forest Roads:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine and medium, granular structure; friable; many fine roots; slightly acid; abrupt, smooth boundary.

B21—8 to 12 inches, yellowish-brown (10YR 5/4) loam; weak, fine and medium, subangular blocky structure; very friable; many fine roots; 8 percent gravel; slightly acid; clear, wavy boundary.

B22—12 to 17 inches, loam that has brown (10YR 5/3) ped exteriors, yellowish-brown (10YR 5/4) ped interiors; moderate, medium, subangular blocky structure; friable; many fine roots; 8 percent gravel; slightly acid; clear, wavy boundary.

A'2—17 to 18 inches, brown (10YR 5/3), pale-brown (10YR 6/3) to light brownish-gray (10YR 6/2) dry, loamy fine sand; single grain; loose; slightly acid; abrupt, broken boundary.

IIB'x1—18 to 23 inches, dark grayish-brown (10YR 4/2) fine sandy loam; few, fine, faint, yellowish-brown (10YR 5/4 and 5/6) and dark yellowish-brown (10YR 4/4) mottles; strong, medium and thick, platy structure; firm; brittle; few fine roots; 10 percent dark-colored shale fragments; common fine pores that have thin clay linings; medium acid; clear, wavy boundary.

IIB'x2—23 to 28 inches, dark-brown to brown (10YR 4/3) fine sandy loam; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, thick, platy structure; firm; brittle; common fine pores that have thin clay linings; 10 percent dark-colored shale fragments; medium acid; clear, wavy boundary.

IIB'x3—28 to 34 inches, dark grayish-brown (10YR 4/2) fine sandy loam; common, medium, faint, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, thick, platy structure; firm; brittle; few fine pores that have thin clay linings; 10 percent dark-colored shale fragments; medium acid; gradual, wavy boundary.

IIC—34 to 52 inches, dark-brown (10YR 3/3) fine sandy loam; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; moderate, thick, platy structure; firm; 10 percent dark-colored shale fragments; medium acid.

The solum ranges from 30 to 60 inches in thickness. The depth to the fragipan ranges from 18 to 36 inches. Coarse fragments range from few to 25 percent by volume in the part above the fragipan, and from 10 to 30 percent in the fragipan and C horizons. The upper horizons are commonly in a silt loam, loam, or very fine sandy loam deposit and range from 12 to 20 inches in thickness. Hues throughout the profile range from 10YR to 5Y.

The Ap horizon has color values of 3 to 5; chroma is 2 to 3. The Ap horizon is silt loam to very fine sandy loam. The B horizon has color values of 4 or 5; chroma is 3 to 6. This horizon is silt loam to fine sandy loam and is granular to blocky in structure. The A'2 horizon has color values of 4 or 5; chroma is 2 or 3. The A'2 horizon is fine sandy loam to loamy fine sand.

The B'x horizons have color values of 3 to 5; chroma is 2 or 3. Mottles are not present in some profiles. The B'x horizons are fine sandy loam to loam, and range from platy to prismatic in structure. Clay films are in some pores.

The C horizon is fine sandy loam or loam. It has color values of 3 or 4; chroma is 2 or 3. Mottles are not present in some profiles. Dark-colored shale commonly is in the fragipan and in the C horizon. The material above the fragipan is higher in silt and lower in sand than the lower part of the solum. Reaction throughout the profile ranges from strongly acid to neutral. Thin lenses of sandy or gravelly material are in the profile in some areas.

Some Broadalbin soils in Herkimer County have thinner sola than defined as the range for the series, but this difference does not alter their usefulness or behavior.

Broadalbin soils are closely associated with the similar but somewhat poorly drained Mosherville soils. They are also near the well-drained Canton and Lansing soils, the moderately well drained Bombay and Conesus soils, the somewhat poorly drained Manheim soils, and the somewhat poorly to poorly drained Massena soils. Broadalbin soils have Bx horizons that are lacking in all of these other soils.

Broadalbin loam, 2 to 8 percent slopes (BrB).—This gently sloping soil is on side slopes and convex ridge tops on uplands. In places some runoff water accumulates. Individual areas are irregularly shaped and range from 5 to 100 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but somewhat poorly drained Mosherville soils in low areas. Also included were small areas of well-drained Lansing and moderately well drained Bombay and Conesus soils, all of which lack the fragipan of Broadalbin soils. In the towns of Fairfield and Norway, areas were included that have a darker colored subsoil and contain more dark-colored shale chips than is normal for this soil.

This soil is suited to most crops grown in the county and to pasture or trees. In places, slight wetness delays planting briefly in spring. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. At higher elevations the short growing season restricts the varieties of crops that can be successfully grown. In places some removal of stones is needed for most efficient use of machinery. Capability unit IIe-6; woodland suitability group 3o1.

Broadalbin loam, 8 to 15 percent slopes (BrC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that in places the upper part of the subsoil is thinner. It is on rolling areas or side slopes on uplands. Individual areas are irregularly shaped and range from 5 to 75 acres.

Included with this soil in mapping were small areas of similar but somewhat poorly drained Mosherville soils in low spots. Also included were small areas of well-drained Lansing and moderately well drained Bombay and Conesus soils, all of which lack the fragipan of Broadalbin soils. In the towns of Fairfield and Norway, areas were included that have a darker colored subsoil and contain more dark-colored shale chips than is normal for the series.

This soil is suited to most crops grown in the county and to pasture or trees. The hazard of erosion is severe in cultivated areas that are unprotected. At higher elevations, the shorter growing season restricts the varieties of crops that can be grown successfully. In some places, removal of stones is needed to make most efficient use of machinery. Capability unit IIIe-3; woodland suitability group 3r1.

Broadalbin loam, 15 to 25 percent slopes (BrD).—This moderately steep soil has a profile similar to the one described as representative for the series except that in places the surface layer and upper part of the subsoil are thinner. It is on hilly areas and side slopes on uplands. Individual areas are irregularly shaped and range from 5 to 50 acres.

Included with this soil in mapping were small areas of well-drained Lansing and moderately well drained Bombay and Conesus soils, all of which lack the fragipan of Broadalbin soils. Also included were some small, wet seep areas. In the towns of Fairfield and Norway, areas were included that have a darker colored subsoil and contain more dark-colored shale chips than is normal for this soil.

This soil is suited to hay, pasture, or trees. It is poorly suited to crops because of the slope and the severe hazard of erosion. Tillage operations should be largely confined to renovation of hay and pasture areas. In places, scattered large stones interfere with tillage and harvesting operations. Capability unit IVe-3; woodland suitability group 3r2.

Broadalbin and Lansing extremely stony soils, 0 to 25 percent slopes (BsD).—These extremely stony soils (fig. 6) have profiles similar to those described as representative for their respective series except that the surface layers are thinner and large stones occupy about 3 to 15 percent of the surface. The stones cover about 50 to 240 cubic yards per acre-foot. Some areas consist of well drained to moderately well drained Broadalbin soils, others consist of well-drained Lansing soils, and a few areas are made up of both soils. They are nearly level to moderately steep and are on uplands. Individual areas are irregular in shape and range from 5 to 40 acres.

Included with these soils in mapping were small areas of wetter Mosherville, Manheim, and Massena soils in low areas and depressions. Also included were small areas of moderately well drained Bombay and Conesus soils that lack a fragipan. In the towns of Norway, Fairfield, and Salisbury, small areas of well-drained Canton soils that have a sandy substratum, lacking in Broadalbin and Lansing soils, were included.

Stoniness prohibits the use of these soils for crops, hay, or renovated pasture. The soils provide some native pasture and are suited to trees and some types of recreational use. Capability unit VIIs-1; woodland suitability group 3x1.

Burdett Series

The Burdett series consists of deep, somewhat poorly drained, medium-textured soils that have a moderately fine textured subsoil. They formed in a silty surficial deposit and shaly glacial till. The silty deposit is 13 to 24 inches thick, underlain by the till. The soils are nearly

Figure 6.—**Broadalbin soil in an area of Broadalbin and Lansing extremely stony soils, 0 to 25 percent slopes.**

level to moderately sloping and are on upland till plains adjacent to the Mohawk Valley. They are medium or high in lime.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. The upper part of the subsoil is mottled yellowish-brown silt loam, about 9 inches thick, that is friable and medium acid. At a depth of 18 inches it is separated from the lower part of the subsoil by a layer of mottled yellowish-brown silt loam, 4 inches thick, that is firm and medium acid. Below a depth of 22 inches, the subsoil is firm, mottled, neutral, dark grayish-brown shaly clay loam. At a depth of 36 inches it merges with the substratum of firm, dark grayish-brown shaly heavy loam till, extending to a depth of 50 or more inches, that has a few faint mottles and is calcareous.

In the spring and during wet periods, the water table in Burdett soils is within 6 to 18 inches of the surface. It is perched on the slowly permeable layer of the subsoil and substratum. Maximum rooting depth is affected by the water table and is mainly 15 to 20 inches. Few roots extend below this as the water table recedes. Available water capacity in the rooting zone is moderate. Available phosphorus is medium to low, and available potassium is high. Available nitrogen is high, but it is released slowly in the spring when the soils are wet and cold. Reaction in the surface layer is strongly acid to slightly acid in unlimed areas. Seasonal wetness is one of the principal limitations to use of these soils for farming. Seasonal wetness and slow permeability are the major limitations for many nonfarm uses.

Representative profile of Burdett silt loam, 3 to 8 percent slopes, cultivated in town of Stark, 1½ miles northeast of Starkville, 2⅝ miles due east of Cramer Corners:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2), light brownish gray (10YR 6/2) dry, silt loam; moderate, medium and fine, granular structure; friable; many fine roots; 5 percent coarse fragments; medium acid; abrupt, smooth boundary.

B2—9 to 18 inches, yellowish-brown (10YR 5/4) crushed, silt loam; many, medium, distinct, yellowish-brown and strong-brown mottles; moderate, medium, subangular blocky structure parting to fine and very fine blocky; friable; ped coatings are grayish-brown (10YR 5/2); thin, patchy clay films on peds and lining a few pores; common fine roots; many fine pores: 5 percent coarse fragments; medium acid; clear, smooth boundary.

A'2&B—18 to 22 inches, yellowish-brown (10YR 5/4) crushed, silt loam; outer parts of peds are light brownish-gray (10YR 6/2) and are 50 percent of the volume; ped interiors are brown (7.5YR 4/4) and have many, medium, distinct, yellowish-brown mottles; moderate, coarse, prismatic structure; hard, firm; patchy, thin clay films on some ped surfaces and lining some pores; 5 percent coarse fragments; medium acid; abrupt, irregular boundary.

IIB'21t—22 to 27 inches, dark grayish-brown (10YR 4/2) crushed, shaly clay loam; moderate, coarse, prismatic structure parting to very weak, thick, platy; firm; dark-gray (5Y 4/1) ped surfaces have nearly continuous clay films in the upper part and patchy clay films in the lower part; ped interiors are 60 percent brown to dark brown (10YR 4/3) and have many, medium and fine, faint, dark grayish-brown and olive-gray mottles; 25 percent coarse fragments, dominantly of soft shale; neutral; gradual, wavy boundary.

IIB'22t—27 to 36 inches, dark grayish-brown (10YR 4/2) shaly clay loam; few, fine, faint, dark-brown mottles; weak, medium, platy structure; firm; dark-gray (10YR 4/1) ped surfaces that have patchy clay films; few roots; few, fine, tubular pores that have clay linings; 25 percent coarse fragments, dominantly of soft shale; neutral; clear, wavy boundary.

IIC—36 to 50 inches, dark grayish-brown (2.5Y 4/2) shaly heavy loam; few, fine, faint, olive-brown mottles; moderate, thin and medium, platy structure; firm; no roots; few, fine, tubular pores; 25 percent coarse fragments, dominantly of soft shale; calcareous; moderately alkaline.

The solum ranges from 30 to 42 inches in thickness. Reaction is strongly acid to neutral, becoming less acid with increasing depth. The depth to carbonates ranges from 30 to 72 inches. The silty deposit ranges from 13 to 24 inches in thickness. The depth to bedrock ranges from 40 inches to many feet. Coarse fragments range from 5 to 15 percent in the silty upper material and 10 to 35 percent in the lower horizons.

The Ap horizon has hues of 10YR or 2.5Y, and values of 3 or 4; chroma is 2. It is weak or moderate, medium or fine, granular in structure.

The B horizon ranges in crushed color from mottled yellowish brown (10YR 5/4) to light brownish-gray 2.5Y 6/2), and is very fine sandy loam or silt loam. It is weak or moderate, very fine through coarse, subangular blocky in structure.

The A'2&B horizon ranges in color from grayish brown (10YR 5/2) through pale olive (5Y6/3) on the outer parts of the peds. In the interiors of the peds, color ranges from brown to dark brown (7.5YR 4/2) through light olive brown (2.5Y 5/4). Mottles are common or many, medium or coarse, faint and distinct. The A'2&B horizon is very fine sandy loam or silt loam. It is moderate, thick, platy to weak, coarse, subangular blocky in structure.

The IIB'2 horizons have colors in the interiors of peds ranging from dark brown (10YR 4/3) to light olive brown (2.5Y 5/4). Ped surfaces range in color from dark gray (N 4/0) to olive gray (5Y 5/2). Mottles are distinct. The texture is heavy loam, clay loam, or silty clay loam. The IIB'2 horizons are weak or moderate, platy, blocky, or prismatic in structure.

The IIC horizon ranges in color from dark brown (7.5YR 4/2) to light olive brown (2.5Y 5/4). The texture is sandy clay loam, silty clay loam, loam, or silt loam. This horizon is weak or moderate, thin through thick, platy in structure or is structureless (massive). Reaction is neutral to moderately alkaline.

Burdett soils are similar in drainage to Appleton and Manheim soils, both of which lack the silty surficial deposit of Burdett soils. Also, Burdett soils have a finer textured Bt horizon than Appleton soils. Burdett soils are near drier Conesus soils that lack the silty surficial deposit of Burdett soils, and wetter Ilion soils, which usually have darker colored surface layers than Burdett soils. In places they are also near somewhat poorly drained Rhinebeck soils that formed in clayey lacustrine sediment and have a finer textured Bt horizon than Burdett soils.

Burdett silt loam, 0 to 3 percent slopes (BuA).—This level to nearly level soil is on flat upland areas where runoff is slow, or is at the base of slopes where water accumulates. Individual areas are irregularly shaped and range from 5 to 100 acres.

Included with this soil in mapping were small areas of drier Conesus soils on knolls and wetter Ilion soils in depressions. Also included were small areas of Manheim soils of similar drainage where the silt mantle is thinner or not present, and small spots that have a surface layer of very fine sandy loam. In the towns of Schuyler, Herkimer, and German Flatts, scattered areas were included that have a thin brittle subsoil layer formed in the silty mantle. In places small spots of Rhinebeck soils that formed in heavy lacustrine sediment were included.

This soil is suited to most crops grown in the county and to pasture or trees. Unless drained, planting is delayed and the choice of crops restricted. Capability unit IIIw-1; woodland suitability group 3w1.

Burdett silt loam, 3 to 8 percent slopes (BuB).—This gently sloping soil is on broad upland areas and foot slopes where runoff accumulates. Individual areas are irregularly shaped and range from 5 to 100 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas that have a surface layer of very fine sandy loam, areas of better drained Conesus soils at higher elevations, and wetter Ilion soils in depressions and along drainageways. Where the silt mantle is thin or not present, small spots of Manheim soils were included. Also included were scattered areas in the towns of Schuyler, Herkimer, and German Flatts that have a thin brittle subsoil layer formed in the silty mantle. In places, small spots of Rhinebeck soils that formed in heavy lacustrine sediment were included.

This soil is suited to most crops grown in the county and to pasture or trees. Unless drained, planting is delayed and the choice of crops restricted. Also, the hazard of erosion is severe in cultivated areas that are unprotected. Capability unit IIIw-3; woodland suitability group 3w1.

Burdett silt loam, 8 to 15 percent slopes (BuC).—This moderately sloping soil has a profile similar to the profile described as representative for the series except that the upper part of the subsoil is thinner in places, and the surface layer is lighter in color because of erosion. It is on foot slopes where runoff from higher areas accumulates. Individual areas are irregularly shaped and range from 5 to 30 acres.

Included with this soil in mapping were small areas of drier Conesus soils and a similar but better drained soil on higher positions, small areas of wetter Ilion soils along drainageways, and small areas that have a surface layer of very fine sandy loam. In the towns of Schuyler, Herkimer, and German Flatts, scattered areas were included that have a thin, brittle subsoil layer in the silty surficial deposit. Other inclusions were small spots of Manheim soils where the surficial silty mantle was thin or not present.

The soil is suited to most crops grown in the county and to pasture or trees. Runoff is rapid and the hazard of erosion is severe in cultivated areas that are unprotected. Also, unless drained, planting is delayed and the choice of crops limited. Hay and pasture plants that tolerate some wetness are well suited to this soil and should be favored in planting systems. Capability unit IIIe-6; woodland suitability group 3w1.

Canton Series

The Canton series consists of deep, well-drained, medium-textured soils that have a noticeable amount of large stones scattered on the surface and throughout the profile. They formed in contrasting deposits of glacial till that are medium textured to moderately coarse textured in the upper part and sandy or very gravelly and sandy below. These soils are gently to moderately sloping, and are on glacial till uplands mainly along the northern fringe of the survey area. They are low in lime.

In a representative profile the surface layer is very dark grayish-brown, stony very fine sandy loam about 11 inches thick. The upper part of the subsoil is very friable, dark-brown very fine sandy loam about 5 inches thick that is strongly acid and extends to a depth of about 16 inches. The lower part of the subsoil is a very friable, medium acid, dark yellowish-brown fine sandy loam about 13 inches thick. It merges with the substratum at a depth of about 29 inches. The substratum is very friable gravelly loamy fine sand that is brown or dark brown. Below a depth of about 36 inches and extending to a depth of 50 or more inches, it has some distinct yellowish-brown mottles. Reaction in the substratum is neutral. A few stone-sized fragments are present throughout the profile.

The water table in Canton soils is at a depth of 42 inches to many feet below the surface. Permeability is moderately rapid or rapid in the surface layer and subsoil and rapid in the substratum. Maximum rooting depth is unrestricted, but is mainly 30 inches. Available water capacity in the rooting zone is moderate. Available phosphorus and potassium are low, and available nitrogen is medium. Reaction of the surface layer ranges from strongly acid to slightly acid in unlimed areas. Stoniness and low fertility are the principal limitations to use of these soils for farming.

Representative profile of Canton stony very fine sandy loam, 2 to 8 percent slopes, in a hayfield in town of Norway, 1 mile north of intersection of Black Creek and Durand Roads:

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2), light brownish-gray (10YR 6/2) dry, stony very fine sandy loam; weak, coarse, granular structure parting to weak, medium, subangular blocky; very friable; many medium and fine roots; few fine pores; few washed sand grains; 10 percent gravel and few stone-sized fragments; medium acid; gradual, smooth boundary.

B21—11 to 16 inches, dark-brown (7.5YR 3/2), yellowish-brown (10YR 5/6) dry, very fine sandy loam; weak, coarse, subangular blocky structure; very friable; common fine and medium roots; common medium and fine pores; 10 percent gravel and few stone-sized fragments; strongly acid; gradual, wavy boundary.

B22—16 to 29 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, coarse, subangular blocky structure; very friable; few fine and medium roots; common medium pores; 15 percent gravel and few stone-sized fragments; medium acid; gradual, wavy boundary.

IIC1—29 to 36 inches, brown to dark-brown (10YR 4/3) gravelly loamy fine sand; weak, coarse, subangular blocky structure parting to structureless (single grain); very friable; few fine roots; few medium pores; 15 to 20 percent gravel and a few stone-sized fragments; neutral; gradual, wavy boundary.

IIC2—36 to 50 inches, brown (10YR 5/3) gravelly loamy fine sand; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; single grain; very friable; 20 percent gravel and few stone-sized fragments; neutral.

The solum ranges from 18 to 36 inches in thickness. Granite, sandstone, and metamorphic rocks such as gneiss are commonly on the surface and randomly scattered throughout the soil profile. The stones range in diameter from 1 to 3 feet, and are 30 to 100 feet apart except where cleared.

The Ap horizon has hues of 10YR, and values of 2 or 3; chroma is 1 or 2. Reaction is strongly acid to slightly acid, depending upon liming practices. Gravel ranges from 5 to 30 percent. The B21 horizon has hues ranging from 7.5YR to

10YR that are not continuous throughout the profile and color values of 3 to 5; chroma is 2 to 4. The texture is very fine sandy loam to sandy loam. This horizon is structureless or has weak, subangular blocky structure. Reaction is strongly acid to slightly acid, and the percentage of coarse fragments ranges from 5 to 30 percent.

The B22 horizon has hues ranging from 10YR to 2.5Y, and values of 4 to 6; chroma is 4 or 5. The texture is fine sandy loam to sandy loam. This horizon is structureless or has weak, subangular blocky structure. Gravel ranges from 15 to 35 percent. Reaction is medium acid to neutral.

The C horizon has hues ranging from 10YR to 2.5Y, and values of 4 or 5; chroma is 3 or 4. The texture is loamy fine sand to loamy sand. This horizon is structureless or has weak, subangular blocky structure. Gravel ranges from 15 to 35 percent. Reaction is medium acid to neutral.

Canton soils in Herkimer County have less acid reactions throughout the profile, and some profiles have lower values and chromas than the defined range for the series, but these differences do not alter their usefulness or behavior.

Canton soils are near somewhat poorly to poorly drained Massena and very poorly to poorly drained Sun soils that formed in similar material. They are also near Broadalbin, Bombay, and Lansing soils. Canton soils lack the fragipan of Broadalbin soils and the Bt horizons of Bombay and Lansing soils.

Canton stony very fine sandy loam, 2 to 8 percent slopes (CaB).—This gently sloping soil is on side slopes and rounded hilltops on glacial till uplands. Stone-sized fragments of granite, gneiss, and sandstone are scattered over the soil surface and are from 30 to 100 feet apart. Individual areas are irregularly shaped, and range from 5 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of wetter Massena and Sun soils in low spots and along drainageways, spots of well drained to moderately well drained Broadalbin soils that have a fragipan, and moderately well drained Bombay soils that have a finer textured subsoil.

This soil is suited to most crops grown in the county and to pasture or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Surface stones interfere with machine tillage, but not enough to make intertilled crops impracticable. Capability unit IIe-1; woodland suitability group 4o1.

Canton stony very fine sandy loam, 8 to 15 percent slopes (CaC).—This moderately sloping soil has a profile similar to that described as representative for the series except that the upper part of the subsoil is thinner in places. Stone-sized fragments of granite, gneiss, and sandstone are scattered over the soil surface, and are from 30 to 100 feet apart.

Included with this soil in mapping were small areas of wetter Massena and Sun soils in low spots and along drainageways, spots of well drained to moderately well drained Broadalbin soils that have a fragipan, and small areas of steeper Canton soils. In some areas in the towns of Norway and Salisbury, small spots of well-drained Lansing soils that have finer textured profiles were included.

This soil is suited to most crops grown in the county and to pasture or trees. Runoff is medium and the hazard of erosion is moderate to severe in cultivated areas that are not protected. Surface stones interfere with machine tillage, but not enough to make intertilled crops impracticable. Capability unit IIIe-1; woodland suitability group 4o1.

Carlisle Series

The Carlisle series consists of organic soils having a water table that is near the surface during wet periods and ranges to below a depth of 30 inches in the dry part of summer. These soils formed in marsh in level areas and depressions in glacial till uplands. The slightly acid to mildly alkaline organic material is more than 51 inches deep over the neutral to mildly alkaline mineral soil material. These soils are high in lime.

In a representative profile the surface layer is black, well-decomposed, neutral muck about 18 inches thick. It is underlain by a dark-brown layer of mucky peat that is neutral and extends to a depth of 48 inches. Below this, to a depth of 62 inches, is a very dark grayish-brown layer of mucky peat that is also neutral.

The water table varies with the season, being at or on the surface during wet periods and dropping below a depth of 30 inches during dry periods in the hot summer. Maximum rooting depth is variable. Available water capacity is high. Available nitrogen is high, but it is slowly available during wet periods when the water table is close to the surface. Available phosphorus is high, and available potassium is low. Most areas of Carlisle muck do not require liming. Excess water is the principal limitation to the use of these soils for farming. Excessive drainage results in oxidation of the surface layer and possible loss of it by soil blowing.

Representative profile of Carlisle muck in a hemlock grove in town of Columbia, 450 feet east of Dropp Road, 0.25 mile north of the junction of McKoons and Dropp Roads:

Oa1—0 to 18 inches, black (10YR 2/1) both wet and dry, well-decomposed organic material; weak, coarse, subangular blocky structure; nonsticky; many live roots; 5 percent fiber rubbed; neutral; gradual, smooth boundary.

Oa2—18 to 48 inches, dark-brown (10YR 3/3), very dark gray (10YR 3/1) dry, partly decomposed organic material; massive; nonsticky; many yellowish-brown (10YR 5/4) dead roots; 8 percent fiber rubbed; neutral; gradual, wavy boundary.

Oa3—48 to 62 inches, very dark grayish-brown (10YR 3/2), very dark gray (10YR 3/1) dry, partly decomposed organic material; massive; nonsticky; many, dark yellowish-brown, dead, fine roots; 20 percent fiber rubbed; neutral.

The organic material is greater than 51 inches thick over the mineral soil material. It has hues of 10YR or 2.5Y and color values of 2 to 4; chroma is 1 to 4. The higher chromas are in material having a high percentage of peat, and the lower chromas are in mostly herbaceous and woody material. Reaction is slightly acid to mildly alkaline. Fiber content is 5 to 10 percent rubbed. The underlying mineral soil material is sand to clay. It has hues of 7.5YR to 5Y, and color values of 3 to 5; chroma is 0 to 2. Reaction is neutral or mildly alkaline.

Carlisle soils have a thicker layer of organic material over mineral soil material than Palms soils. Carlisle soils formed in organic material, whereas the poorly drained and very poorly drained Lyons, Ilion, Sun, and Lamson soils formed in mineral soil material.

Carlisle muck (Cm).—This level and nearly level soil formed in a marsh environment on glacial till uplands. Individual areas are irregularly shaped, and range from 2 to 30 acres. The organic soil material is at a depth of more than 51 inches over mineral soil material. In most areas runoff is received from adjacent, better drained soils.

Included with this soil in mapping were small areas of shallower Palms muck and spots of Lyons, Ilion, Allis, Sun, or Lamson soils that formed in mineral deposits on slight rises and higher positions.

Unless drained, this soil is not suited to crops and is poorly suited to pasture and trees. When drained, it can be made highly productive for crops, especially vegetables. Excessive drainage results in oxidation of the surface layer and possible loss by soil blowing. Capability unit not assigned; woodland suitability group 5w2.

Cohoctah Series

The Cohoctah series consists of deep, poorly drained and very poorly drained, medium-textured soils that have a moderately coarse textured subsoil. These soils formed in recent alluvium that is slightly acid to neutral. They are nearly level, and are in old channels on flood plains. Cohoctah soils are medium to high in lime.

In a representative profile the surface layer is black mucky very fine sandy loam that, at a depth of 6 inches, becomes very dark gray, neutral, friable very fine sandy loam that is distinctly mottled. Below a depth of 12 inches the subsoil is prominently mottled, very dark gray fine sandy loam about 9 inches thick that is very friable and neutral. The neutral substratum begins at a depth of 21 inches. It is mottled, very dark gray, very friable loamy fine sand to a depth of 27 inches. Below this, to a depth of 50 or more inches, it is mottled, black, very friable loam.

Cohoctah soils have a prolonged high water table at or near the surface much of the year. They are subject to flooding. Permeability is moderately rapid. Maximum rooting depth is affected by depth to the water table, and is mainly 12 inches. Available water capacity is moderate, but normally more than enough water is available for plant growth. Available phosphorus and potassium are medium to low. Available nitrogen is high, but it is slowly available due to the prolonged high water table. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Excess water and flooding are the principal limitations to the use of these soils for farming.

Representative profile of Cohoctah mucky very fine sandy loam, in a meadow in town of Manheim, 265 feet south of New York State Highway 5, and 0.2 mile west of intersection of New York State Highway 5 and East Canada Creek:

A11—0 to 6 inches, black (10YR 2/1), very dark gray (10YR 3/1) dry, mucky very fine sandy loam; weak, fine, granular structure; very friable; many coarse roots; many medium pores; few washed sand grains; neutral; gradual, smooth boundary.

A12—6 to 12 inches, very dark gray (10YR 3/1), gray (10YR 5/1) dry, very fine sandy loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, coarse, subangular blocky structure that parts to weak, coarse, granular; friable; many coarse roots; many medium pores; neutral; gradual, smooth boundary.

B2—12 to 21 inches, very dark gray (10YR 3/1), gray to light-gray (10YR 6/1) dry, fine sandy loam; common, medium, prominent, yellowish-red (5YR 4/6) mottles; weak, coarse, subangular blocky structure; very friable; common medium pores; neutral; gradual, smooth boundary.

IIC1—21 to 27 inches, very dark gray (10YR 3/1), dark-gray (10YR 4/1) dry, loamy fine sand; common, medium, distinct, yellowish-red (5YR 4/6) mottles; single grain; very friable; common medium pores; 10 percent gravel; neutral; gradual, smooth boundary.

IIIC2—27 to 50 inches, black (10YR 2/1), very dark gray (10YR 3/1) dry, loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; very friable; 5 percent gravel; neutral.

Reaction of the upper horizons is slightly acid or neutral in places, but becomes neutral with depth. Textures above depths of 40 inches are silt loam to loamy fine sand, but are dominantly fine and very fine sandy loams. Gravel is less than 15 percent. The solum has hues of 10YR or 7.5YR, and values of 2 to 4; chroma is 1 or 2. Thin lenses of sand, loamy sand, loamy fine sand, silt loam, and silt are in some profiles.

Cohoctah soils are closely associated on flood plains with the well-drained Hamlin soils and the moderately well drained to somewhat poorly drained Teel soils that formed in similar material. Cohoctah soils are similar in drainage to Wayland soils that also formed in alluvial deposits, but Cohoctah soils have coarser textured profiles.

Cohoctah mucky very fine sandy loam (Co).—This level or nearly level soil is in low spots and depressions on flood plains, and often occupies old abandoned stream channels. Individual areas are long and narrow, and range from 3 to 15 acres.

Included with this soil in mapping were small areas of better drained Teel soils on higher, better drained positions, and spots of similar but finer textured Wayland soils.

Wetness and the hazard of flooding limit the use of this soil for crops, unless drained. Drainage outlets are generally difficult to locate. This soil provides some pasture during dry periods. It is poorly suited to trees because of excess water. Capability unit VIw-1; woodland suitability group 5w2.

Conesus Series

The Conesus series consists of deep, moderately well drained, medium-textured soils that formed in glacial till derived mainly from limy shales that have some limestone and sandstone. These soils are gently sloping and are on uplands. They are medium in lime.

In a representative profile the surface layer is dark-brown silt loam about 6 inches thick, underlain by a subsurface layer, about 5 inches thick, of dark yellowish-brown, strongly acid, very friable silt loam. The upper part of the subsoil is brown to dark-brown, friable silt loam about 8 inches thick that has a few faint mottles in the lower part. The lower part of the subsoil begins at a depth of 19 inches. It consists of mottled, very dark grayish-brown, medium acid, firm gravelly silt loam to gravelly heavy loam about 16 inches thick. The substratum, between depths of 35 and 55 inches, is mottled, very dark grayish-brown gravelly heavy loam or light clay loam that is firm and slightly acid. Below this, to a depth of 61 or more inches, it is faintly mottled, dark-brown gravelly heavy silt loam that is firm and calcareous.

During wet periods and in spring, the water table is perched over the firm, slowly or very slowly permeable substratum, and comes within 18 to 24 inches of the surface in places. Maximum rooting depth is 24 inches early in the season. Few roots extend below this as the water table recedes. Available water capacity is high. Available potassium is medium to high, and available phosphorus and nitrogen are medium. Reaction in the surface layer is strongly acid to slightly acid in unlimed areas. Slight seasonal wetness is one of the principal limitations to the use of these soils for farming.

Representative profile of Conesus silt loam, 2 to 8 percent slopes, cultivated in town of Schuyler, 1.2 miles east of the intersection of Windfall and Shortlots Roads, 0.3 mile north of Shortlots Road and 0.2 mile west of Sullivan Road:

Ap—0 to 6 inches, dark-brown (10YR 3/3), yellowish-brown (10YR 5/4) dry, silt loam; weak, fine, granular structure; friable; many roots; 13 percent gravel; medium acid; abrupt, smooth boundary.

A&B—6 to 11 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, subangular blocky structure; very friable; many fine roots; 13 percent gravel; strongly acid; clear, wavy boundary.

B21—11 to 19 inches, brown to dark-brown (10YR 4/3) silt loam; few, fine, faint yellowish-brown (10YR 5/4) mottles in lower part; moderate, medium, subangular blocky structure; friable; many fine roots; 13 percent gravel; strongly acid; clear, wavy boundary.

IIB22t—19 to 23 inches, gravelly silt loam to heavy loam that has dark grayish-brown (10YR 4/2) ped faces, very dark grayish-brown (10YR 3/2) ped interiors; few, fine, faint yellowish-brown (10YR 5/6), dark yellowish-brown (10YR 4/4), and grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; common fine roots; 15 percent gravel; patchy clay films on ped faces and in pores; medium acid; gradual, wavy boundary.

IIB23t—23 to 35 inches, very dark grayish-brown (10YR 3/2) gravelly heavy loam; few, fine, faint yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, subangular blocky structure; firm; few fine roots; 15 percent gravel; patchy clay films on ped faces and in pores; medium acid; gradual, wavy boundary.

IIC1—35 to 55 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) gravelly heavy loam or light clay loam; common, fine, faint yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) mottles; massive; firm; 20 to 25 percent gravel; thin clay films in pores; slightly acid; gradual, wavy boundary.

IIC2—55 to 61 inches, dark-brown (10YR 3/3) gravelly heavy silt loam; few, fine, faint yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) mottles; weak, medium to thick, platy structure; firm; 20 to 25 percent gravel; calcareous; mildly alkaline.

The solum ranges from 30 to 45 inches in thickness. The depth to free carbonates is between 30 and 55 inches. Coarse fragments range from 5 to 30 percent in the solum and from 20 to 50 percent in the C horizon. These soils have hues ranging from 2.5Y to 10YR.

The Ap or A1 horizons have color values of 3 to 5; chroma is 2 or 3. This horizon is weak, granular or subangular blocky in structure. Reaction is strongly acid to neutral, depending on liming practices.

The A&B horizon is the A2 interfingering into the B2. The A2 part of this horizon has color values of 4 to 6; chroma is 3 to 5. The B2 part has color values of 3 to 5; chroma is 3 or 4. The texture of the A&B horizon is silt loam or loam. This horizon is weak to moderate, medium and fine, angular to subangular blocky in structure. Reaction is strongly acid to slightly acid.

The IIB2t horizon has a color value of 3 to 5; chroma is 2 or 3. High-chroma mottles often are in this horizon as well as in the A&B horizon. The texture is heavy loam or heavy silt loam. This horizon is weak to moderate, angular and subangular blocky in structure. Reaction is medium acid to neutral.

The C horizon has color values of 3 to 5; chroma is 2 or 3. This horizon has both high- and low-chroma mottles in places. Reaction is neutral to mildly alkaline.

Conesus soils in Herkimer County have darker colors in the lower part of the profile than is defined as the range for the series. Also, depth to carbonates in some profiles is slightly deeper. These differences do not alter the usefulness or behavior of the soils.

Conesus soils are closely associated with the well-drained Lansing, somewhat poorly drained Appleton, and poorly to very poorly drained Lyons soils that formed in similar material. They are also near similar Bombay and Lima soils. Conesus soils have finer textured Bt horizons than Bombay, and are more acid than Lima soils. In places they are near Broadalbin soils, which have a fragipan that is lacking in Conesus soils.

Conesus silt loam, 2 to 8 percent slopes (CsB).—This gently sloping soil is on ridgetops and side slopes of glacial till uplands where runoff is somewhat slow or accumulates to a slight degree. Individual areas are irregularly shaped, and range from 5 to 75 acres.

Included with this soil in mapping were small areas of better drained Lansing soils on higher positions, and wetter Appleton and Lyons soils in depressed areas or along drainageways. Small spots of coarser textured Bombay soils were included in the towns of Norway, Fairfield, and Salisbury. Also included in the towns of Russia, Newport, and Norway were small areas of Broadalbin soils that have a fragipan. South of the Mohawk River, spots of less acid Lima soils were included. In places, small areas of a similar soil that has a mantle of thick eolian silt were included.

This soil is suited to most crops grown in the county and to pasture or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Slight wetness in places delays planting briefly in spring. Random drainage of the wetter soils is generally a desirable management practice. Capability unit IIe-4; woodland suitability group 2o1.

Cut and Fill Land

Cut and fill land (Cu) consists of nearly level to steep areas of soil material recently disturbed by man. This material in cuts and fills has not been exposed or has not been in place long enough for profile development to take place. Areas consist of borrow pits mainly along the New York State Thruway, canal dredgings and dikes and levees along the canal, larger cut and fill areas along highways and railroads, and some abandoned gravel pits.

Included with this land type in mapping were small areas that are artificially filled with trash, or trash and earth, and land so altered or obscured by urban works and structures that identification of particular soils was not feasible. In places, small areas were included where bedrock has been exposed in cuts.

Some areas of Cut and fill land can be reclaimed for some types of farming, trees, or other use, especially those that have less steep slopes. Other areas are poorly suited to such uses and require considerable manipulation if they are to be so used. Careful onsite investigation is needed to determine the feasibility for any contemplated use. Capability unit and woodland suitability group not assigned.

Farmington Series

The Farmington series consists of shallow, well-drained, medium-textured soils that formed in glacial till deposits that are 10 to 20 inches thick over bedrock. The bedrock is generally limestone but is hard sandstone in places. These soils are nearly level to steep and are on upland landscapes where the bedrock affects the relief.

Farmington soils are medium in lime. Rock outcrops are common in places, and there are a few sinkholes.

In a representative profile the surface layer is very dark grayish-brown silt loam that has a few gravelly fragments and is 8 inches thick. The subsoil is friable silt loam that contains some gravelly fragments. It is dark yellowish-brown in color between depths of 8 and 12 inches, yellowish-brown between depths of 12 and 18 inches, and dark brown in the 1-inch layer above bedrock that begins at a depth of 19 inches. Reaction is mostly medium acid to a depth of 18 inches, and slightly acid just over the rock.

The water table is below the depth of the soil to bedrock at all times. Water that does not run off the surface drains through solution joints. Permeability is moderate. Effective rooting depth is 10 to 20 inches, although a few roots do penetrate into solution joints in the limestone bedrock. Available water capacity is low. Available nitrogen and potassium are medium, and available phosphorus is medium to low. Reaction in the surface layer is medium acid to neutral in unlimed areas.

The shallow depth to bedrock is one of the major limitations to the use of these soils for farming. The soils are a source of limestone for crushing in some areas. North of the Mohawk River are some areas that are a source of the so-called "Herkimer diamonds." Prospecting for these quartz crystals is a local tourist activity of note.

Representative profile of Farmington silt loam, 0 to 8 percent slopes, in pasture in town of Columbia, 0.5 mile northwest of Schuyler Corners and 100 feet north of Hugick Road:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2), dark-brown (10YR 3/3) rubbed, silt loam; weak, fine, granular structure; friable; 5 percent gravel; neutral; abrupt, smooth boundary.

B21—8 to 12 inches, dark yellowish-brown (10YR 4/4) silt loam; weak and moderate, fine and medium, granular and subangular blocky structure; friable; 5 to 10 percent gravel; medium acid; gradual, smooth boundary.

B22—12 to 18 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium and fine, granular and subangular blocky structure; friable; 5 to 10 percent gravel; medium acid; gradual, smooth boundary.

B23—18 to 19 inches, dark-brown (10YR 3/3) heavy silt loam; weak, medium and fine, subangular blocky structure; friable; 5 to 10 percent gravel; slightly acid; abrupt, smooth boundary.

R—19 inches +, limestone bedrock.

The solum ranges from 10 to 20 inches in thickness and corresponds to the depth to hard rock. The rock is generally jointed limestone, but may be sandstone. Texture of the solum is fine sandy loam, loam, and silt loam. Coarse fragments in the solum range from 5 to 35 percent. Hue ranges from 7.5YR to 2.5Y. The Ap horizon has color values of 3 to 5; chroma is 2 or 3. This horizon is weak, granular in structure. Reaction is medium acid to neutral. The B2 horizons have color values of 4 or 5; chroma is 3 or 4. They range from weak to moderate, granular to subangular blocky in structure. Reaction is medium acid to neutral. The limestone is usually jointed and fractured to permit internal drainage. Rocky phases of Farmington are where bedrock protrudes the surface.

Farmington soils are closely associated with moderately deep Wassaic soils. They are shallower to bedrock and lack the Bt horizon of Wassaic soils. They are similar to shallow Nassau soils, but have a higher base saturation. In places, Farmington soils are also near deep Honeoye and Ontario soils.

Farmington silt loam, 0 to 8 percent slopes (FaC).—This nearly level and gently sloping soil is on bedrock-controlled till plains on uplands. Joint cracks in the limestone and a few scattered sinkholes are apparent in places. Individual areas are irregularly shaped and range from 5 to 75 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of moderately deep Wassaic soils, deeper areas of well-drained Honeoye and Ontario soils, and small areas of rock outcrop and very shallow soil.

This soil has limited suitability for crops, pasture, or trees. Lack of moisture due to the shallow root zone is a major management problem, especially in dry years. Also there is a hazard of erosion on the more sloping areas in cultivated areas that are unprotected. Capability unit IIIs-2; woodland suitability group 5d1.

Farmington very rocky silt loam, 0 to 25 percent slopes (FcD).—This nearly level to moderately steep soil has a profile similar to the profile described as representative for the series except that limestone bedrock is exposed on 10 to 25 percent of the surface, and the depth to bedrock is less uniform from place to place (fig. 7). It is on bedrock-controlled till plains on uplands. Joint cracks in the limestone and a few sinkholes are apparent in places. Individual areas are irregularly shaped, and range from 5 to 75 acres.

Included with this soil in mapping were small areas that are at depths of less than 10 inches, areas deeper than 20 inches over bedrock, and small spots of moderately deep Wassaic soils and deep Honeoye and Ontario soils.

Rocks prohibit the use of this soil for crops. The soil provides some early pasture, but lack of moisture limits plant growth as the season progresses. It also has limited suitability for trees and some types of recreational use. Capability unit VIIs-3; woodland suitability group 5x1.

Figure 7.—**An area of Farmington very rocky silt loam, 0 to 25 percent slopes. Limestone bedrock is exposed in 10 to 25 percent of the acreage.**

Farmington-Rock land complex, steep (FkE).—This steep and very steep complex is made up of 20 to 75 percent Farmington soil and 25 to 80 percent exposed bedrock that is generally limestone. Slabs of limestone are present in places. The complex is on landscapes that are strongly influenced by the exposed bedrock. Individual areas are irregularly shaped or are long and narrow on steep breaks, and range from 5 to 50 acres.

Included with this complex in mapping were small areas of soils that are at a depth of less than 10 inches, areas deeper than 20 inches over bedrock, and small spots of moderately deep Wassaic soils and deep Honeoye and Ontario soils.

Slope and rocks prohibit the use of this complex for crops. It is poorly suited to pasture and trees. It is suited to some forms of recreation in places. Capability unit VIIs-3; woodland suitability group 5x2.

Fredon Series

The Fredon series consists of deep, somewhat poorly to poorly drained, moderately coarse textured soils that formed in gravelly outwash deposits derived mainly from sandstone, limestone, and shale. They are nearly level or are in depressions on glacial outwash terraces. Fredon soils are medium to high in lime.

In a representative profile the surface layer is black fine sandy loam that contains some gravel and is 6 inches thick. The upper part of the subsoil is mottled, brown to dark-brown, friable gravelly fine sandy loam about 9 inches thick. Between depths of 15 and 23 inches, the subsoil is mottled, dark grayish-brown, friable very gravelly fine sandy loam. The subsoil is neutral. The calcareous substratum begins at a depth of 23 inches and extends to a depth of 50 or more inches. It consists of grayish-brown, very friable very gravelly loamy sand.

During the wet periods and in spring, the water table is within 6 to 18 inches of the surface. During dry periods it falls below a depth of 20 inches. Permeability is moderately rapid to rapid in the surface layer and subsoil, and rapid in the substratum. The water table determines maximum rooting depth. Few roots penetrate below a depth of 20 inches. Available water capacity is low to moderate. Available nitrogen is high, but it is released very slowly during wet periods. Available potassium is medium, and available phosphorus is medium to low. Reaction in the surface layer is medium acid to neutral in unlimed areas.

Excess water is the principal limitation to the use of these soils for farming.

Representative profile of Fredon fine sandy loam, in a hemlock grove in town of Columbia, 120 feet south of Millers Mills Road, 0.12 mile east of the intersection of Millers Mills and Saxon Roads:

A1--0 to 6 inches, black (10YR 2/1), dark-gray (10YR 4/1) dry, fine sandy loam; weak, medium and coarse, granular structure; very friable; many coarse, medium, and fine roots; few medium pores; few washed sand grains; 5 percent gravel; neutral; gradual, smooth boundary.

B21—6 to 15 inches, brown to dark-brown (10YR 4/3) gravelly fine sandy loam; few, fine, faint yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few medium roots; common medium pores; many black (10YR 2/1) worm casts; 30 percent gravel; neutral; gradual, wavy boundary.

IIB22—15 to 23 inches, dark grayish-brown (10YR 4/2) very gravelly fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few pores; 50 percent coarse fragments; neutral; gradual, wavy boundary.

IIIC—23 to 50 inches, grayish-brown (10YR 5/2) very gravelly loamy sand; single grain; very friable; 70 percent coarse fragments; calcareous; moderately alkaline.

The solum ranges from 22 to 35 inches in thickness. Reaction is medium acid to mildly alkaline. In most areas, the substratum is moderately alkaline and is calcareous. Hues range from 7.5YR to 5Y. The A1 or Ap horizon has values of 2 to 4; chroma is 1 to 4. The B horizon has color values of 4 to 6; chroma is 2 to 4. The texture is loam to sandy loam. Gravel ranges from 15 to 50 percent. The C horizon has values of 3 to 6; chroma is 2 to 4. The texture is and to loamy sand. Coarse fragments range from 35 to 80 percent. Both high- and low-chroma mottles are in the B and C horizons in places.

Fredon soils in Herkimer County are shallower to carbonates than is defined as the range for the series. Generally, less lime is needed for good plant growth than is characteristic for the series in other areas. Also, the B horizons, in places, have darker values than are described as representative for the series, but this difference does not alter the usefulness or behavior of the soils.

Fredon soils are closely associated with Howard, Palmyra, Herkimer, Phelps, and Halsey soils, all of which formed in similar material. They are wetter than Howard, Palmyra, Herkimer, and Phelps soils, and are better drained than Halsey soils.

Fredon fine sandy loam (Fr).—This level or nearly level soil is on flat areas and depressions on glacial outwash terraces. Individual areas are irregularly shaped, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of better drained Phelps and Herkimer soils on higher positions, spots of wetter Halsey soils, and small areas where the surface layer is gravelly or finer in texture.

This soil is suited to most crops grown in the county and to pasture or trees. Unless drained, planting is delayed and the choice of crops restricted. Drainage outlets are difficult to locate in places. Capability unit IIIw-1; woodland suitability group 3w2.

Fresh Water Marsh

Fresh water marsh (Fw) consists of marshy areas around ponds in uplands. Some ponded areas are natural, some are manmade, and some have been made by beavers damming streams. This periodically flooded land type is covered dominantly with grasses, cattails, rushes, or other herbaceous plants. It normally does not support trees, except along the edges where the water is shallow.

This land type is suited for some recreational and wildlife uses. Capability unit VIIIw-1; woodland suitability group not assigned.

Halsey Series

The Halsey series consists of deep, very poorly drained, medium-textured to moderately coarse textured soils that formed in glacial outwash deposits derived mainly from sandstone, limestone, and shale. In places some granitic rocks are present. These soils are level or nearly level, and are in depressions on glacial outwash terraces. They are medium to high in lime.

In a representative profile the surface layer is black mucky silt loam that contains a trace of gravel and is 6 inches thick. The subsurface layer is mottled, dark grayish-brown, very friable gravelly silt loam that is neutral and extends to a depth of 13 inches. The subsoil is a mottled, dark grayish-brown, neutral, very friable gravelly silt loam about 1 inch thick. At a depth of about 20 inches it merges with the substratum, which consists of dark-brown, loose gravelly loamy sand that is neutral and extends to a depth of 50 or more inches.

The water table is at or near the surface of the Halsey soils during most of the year. Permeability is moderate in the surface layer and subsoil and rapid in the substratum. Few roots penetrate below depths of 12 inches because of the high water table. Available water capacity is moderate. Available nitrogen is high, but it is released slowly because of the waterlogged condition of the Halsey soils during most of the year. Available phosphorus is medium to low, and available potassium is medium. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Excess water is the major limitation to the use of these soils for farming.

Representative profile of Halsey mucky silt loam from an area of Halsey soils, in pasture in town of Schuyler, 924 feet east of Windfall Road, 0.2 mile northeast of the intersection of Windfall Road and New York State Highway 5.

A1—0 to 6 inches, black (10YR 2/1) crushed and uncrushed, dark-gray (10YR 4/1) dry, mucky silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, granular structure; very friable; many fine roots; common medium pores; 3 percent gravel; neutral; abrupt, smooth boundary.

A2g—6 to 13 inches, dark grayish-brown (2.5Y 4/2), dark grayish-brown (10YR 4/2) crushed, gravelly silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; very friable; few fine roots; common fine pores; 30 percent gravel; neutral; gradual, wavy boundary.

B2g—13 to 20 inches, dark grayish-brown (10YR 4/2), very dark grayish-brown (10YR 3/2) crushed, gravelly silt loam; few, fine, distinct, yellowish-brown (10YR 5/4) and light yellowish-brown (10YR 6/4) mottles; weak, medium, subangular blocky structure; very friable; common, very fine pores; 15 to 20 percent gravel; neutral; gradual, wavy boundary.

IICg—20 to 50 inches, dark-brown (7.5YR 3/2) crushed and uncrushed, gravelly loamy sand; single grain; loose; 30 percent coarse fragments; neutral.

The solum ranges from 20 to 30 inches in thickness. Coarse fragments consist of black and grayish-brown shale, red and brown sandstone, quartz, and limestone gravel and cobblestones. Feldspar and mica from gneiss or granite, or their weathered remains, are minor constituents. The texture is silt loam to fine sandy loam. Gravel ranges from 10 to 35 percent. Reaction is slightly acid to neutral, and is moderately alkaline in the C horizons in some profiles. The Ap and A1 horizons have hues ranging from 7.5YR to 2.5Y, and values of 2 or 3; chroma is 1 or 2. In the B and C horizons, hue ranges from 7.5YR to 5Y or is neutral. These horizons have values of 3 to 5; chroma is 1 or 2 or neutral. All horizons contain high-chroma mottles.

Halsey soils have lower values in the B and C horizons than is defined as the range for the series, but this difference does not alter their usefulness or behavior.

Halsey soils are the wetter associates of Palmyra, Howard, Herkimer, Phelps, and Fredon soils, all of which formed in similar glacial outwash deposits. In places Halsey soils are near poorly and very poorly drained Cohoctah soils that formed in recent alluvium and lack the gravel of Halsey soils.

Halsey soils (Ha).—These level to nearly level soils include areas with similar profiles that have loam or fine sandy loam surface and subsoil layers and are gravelly in places. They are in depressions and drainage channels on glacial outwash terraces. Individual areas are round or elliptical in depressions, long and narrow along drainageways, and from 3 to 20 acres in size.

Included with these soils in mapping were small areas of better drained Fredon soils on slight rises, and small spots of less gravelly Cohoctah soils along drainageways that are subject to flooding.

Unless drained, wetness prohibits the use of these soils for crops. They provide some pasture during dry periods, and are suited to water-tolerant trees. With adequate drainage, they are suited to many of the crops grown in the county. Drainage outlets are generally very difficult to locate. Capability unit IVw-1; woodland suitability group 5w2.

Hamlin Series

The Hamlin series consists of deep, well-drained, medium-textured and moderately coarse textured soils that formed in recent alluvium. They are level or nearly level and are on flood plains of the major streams throughout the county. These soils are medium in lime.

In a representative profile the surface layer is very dark gray silt loam about 15 inches thick. The subsoil is very dark grayish-brown silt loam about 23 inches thick. It is very friable and neutral. The substratum, which begins at a depth of 38 inches, consists of faintly mottled, dark-gray silt loam that is very friable and neutral and extends to a depth of 51 or more inches.

Hamlin soils are subject to occasional flooding, which generally occurs in the spring. The water table is normally at a depth of 2 to 2½ feet or more. Permeability is moderate. Maximum rooting depth is 30 inches or more. Available water capacity is high. Available phosphorus and potassium are medium. Available nitrogen is generally high. Reaction in the surface layer is slightly acid to neutral in unlimed areas. The occasional hazard of flooding is the principal limitation to the use of these soils for farming.

Representative profile of Hamlin silt loam, cultivated in town of Frankfort, 324 feet west of Dyke Road and 186 feet south of the bridge spanning the Mohawk River:

Ap—0 to 9 inches, very dark gray (10YR 3/1), light-gray to gray (10YR 6/1) dry, silt loam; weak, medium, granular structure; friable; slightly compacted plowsole; few fine roots; common fine pores; neutral; abrupt, smooth boundary.

A12—9 to 15 inches, very dark gray (10YR 3/1), light brownish-gray (2.5Y 6/2) dry, silt loam; weak, medium, subangular blocky structure; very friable; few fine roots; many medium and fine pores; neutral; gradual, wavy boundary.

B21—15 to 30 inches, very dark grayish-brown (10YR 3/2), light brownish-gray (2.5Y 6/2) dry, silt loam; weak, medium and coarse, subangular blocky structure; very friable; few fine roots; common medium and fine pores; neutral; gradual, wavy boundary.

B22—30 to 38 inches, very dark grayish-brown (10YR 3/2), light brownish-gray (2.5Y 6/2) dry, silt loam; weak, medium and fine, subangular blocky structure; very friable; common medium and fine pores; neutral; gradual, wavy boundary.

C—38 to 51 inches, dark-gray (10YR 4/1) silt loam; few, fine, faint yellowish-brown (10YR 5/6) mottles; massive; very friable; neutral.

The solum ranges from 24 to 40 inches in thickness. The depth to free carbonates is greater than 40 inches. Reaction is slightly acid or neutral in the upper 20 inches and neutral below. Hues throughout the profile range from 7.5YR to 2.5Y. The A horizon has color values of 3 or 4; chroma is 1 to 3. Dry values are 6 or higher. This horizon is silt loam to fine sandy loam. The B horizon has color values of 3 to 5; chroma is 1 to 4. Mottles are below depths of 24 inches in places. This horizon is silt loam to fine sandy loam. Color and texture ranges in the C horizon are the same as those of the B horizon. Coarse fragments are absent or few between depths of 10 and 40 inches. Below a depth of 40 inches, strata of gravel, cobblestones, or shale fragments are present in places.

Hamlin soils are closely associated on flood plains with moderately well drained to somewhat poorly drained Teel soils, poorly drained to very poorly drained Wayland soils, and very poorly drained Cohoctah soils, all of which formed in similar material.

Hamlin fine sandy loam (He).—This level or nearly level soil has a profile similar to the profile described as representative for the series except that it is coarser in texture throughout the profile. It is on higher flood plains along the major streams in the county. Individual areas are long and narrow, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of wetter Teel and Cohoctah soils in lower positions and in depressions, and small areas of Hamlin silt loam.

This soil is suited to most crops grown in the county and to pasture or trees. It is one of the better soils for intensive cultivation in the county. Occasional flooding is a problem, but it rarely occurs during the growing season. Streambank erosion is a problem in places. Capability unit I–2; woodland suitability group 2o1.

Hamlin silt loam (Hf).—This level or nearly level soil is on higher flood plains along the major streams in the county. Individual areas are long and narrow, and range from 5 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of wetter Teel, Wayland, and Cohoctah soils in low areas, and a few spots of Hamlin fine sandy loam.

This soil is suited to most crops grown in the county and to pasture or trees. It is well suited to intensive cultivation. Flooding is an occasional problem, but it rarely occurs during the growing season. Streambank erosion is a problem in places. Capability unit I–2; woodland suitability group 2o1.

Hartland Series

The Hartland series consists of deep, well-drained, medium-textured soils that formed in lacustrine or stream terrace deposits of silt and very fine sand. In Herkimer County, Hartland soils are mapped only in a complex with Agawam soils. Hartland soils are gently sloping to moderately steep, and are only in the northeastern part of the survey area. They are medium to low in lime.

In a representative profile the surface layer is very dark grayish-brown silt loam about 10 inches thick. The upper part of the subsoil is brown to dark-brown light silt loam about 11 inches thick. It is very friable or friable, and slightly acid to medium acid. Between depths of 21 and 30 inches, the subsoil is brown to dark-brown, neutral, friable very fine sandy loam. At a depth of 30 inches it merges with the substratum, which consists of brown to dark-brown, neutral, very friable very fine sandy loam that has a few faint mottles and extends to a depth of 50 or more inches.

In Hartland soils the water table is at a depth of 30 inches to several feet. Permeability is moderate. Maximum rooting depth is 30 inches or more. Available water capacity is high. Available phosphorus and potassium are low to medium, and available nitrogen is medium. Reaction in the surface layer is strongly acid to neutral in unlimed areas. The hazards of erosion and soil blowing are the principal limitations to the use of this soil for farming.

Representative profile of Hartland silt loam from an area of Hartland-Agawam complex, 3 to 8 percent slopes, in a hayfield in town of Salisbury, 366 feet east of Brown Road, and 0.08 mile south of the intersection of Brown and Emmonsburg Roads:

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

B21—10 to 14 inches, brown to dark-brown (7.5YR 4/4) light silt loam; weak, medium, subangular blocky structure; very friable; common fine roots; many medium and fine pores; slightly acid; gradual, wavy boundary.

B22—14 to 21 inches, brown to dark-brown (10YR 4/3) light silt loam; moderate, medium, subangular blocky structure; friable; few fine roots; common medium and fine pores; scattered fine sand grains; 5 percent gravel; medium acid; gradual, wavy boundary.

B23—21 to 30 inches, brown to dark-brown (10YR 4/3) very fine sandy loam; weak, medium, subangular blocky structure or structureless (massive); friable; common medium and fine pores; slightly acid; gradual, wavy boundary.

C—30 to 50 inches, brown to dark-brown (10YR 4/3) very fine sandy loam; few, fine, faint yellowish-brown (10YR 5/6) mottles; massive; very friable; few scattered pores; neutral.

The solum ranges from 14 to 30 inches in thickness. Coarse fragments are absent or no more than 1 percent throughout the profile. The profile is dominantly very fine sandy loam and silt loam. Varves that are very fine sand or loamy very fine sand are in the lower portion of some profiles. Reaction is strongly acid to neutral throughout the profile. The A1 and Ap horizons have hues of 10YR to 2.5Y, and moist values of 3 or 4; chroma is 2 or 3.

Hues range from 7.5YR to 2.5Y in the B horizon, and the redder hues are concentrated in the upper part of the horizon. This horizon has color values of 4 or 5; chroma is 3 or 4.

In the C horizon, moist hue ranges from 10YR to 5Y. This horizon has values of 3 through 6; chroma is 2 through 6. The C horizon may or may not be varved, and is very fine sandy loam or silt loam.

Some Hartland soils have redder hues and lower values and chromas than defined as the range for the series, but these differences do not alter their usefulness or behavior.

Hartland soils are very closely associated with Agawam soils. In Herkimer County they are mapped only as a complex with Agawam soils. They contain more silt in the upper 40 inches than Agawam soils. Hartland soils are also near Williamson, Windsor, and Howard soils. They lack the fragipan and are better drained than Williamson soils, have finer textured B horizons than Windsor soils, and lack the gravelly solum of Howard soils.

Hartland-Agawam complex, 3 to 8 percent slopes (HgB).—This complex consists of about 35 percent gently sloping Hartland soils and 65 percent gently sloping Agawam soils. The surface layer of Hartland soils is mainly silt loam, but ranges to very fine sandy loam. The surface layer of Agawam soils is mainly very fine sandy loam, but ranges to loam. The soils of this complex are on smoothly sloping to undulating landscapes of stream terraces and lake plains. Individual areas are irregular in shape, and range from 5 to 50 acres. The Hartland soil in this complex has the profile described as representative for the Hartland series.

Included with this complex in mapping were small areas of Williamson soils that have a fragipan and are moderately well drained, small spots of sandy Windsor soils and gravelly Howard soils, small areas where glacial till is observed within 40 inches of the surface, and spots of similar soils that have a thin, brittle layer in the subsoil.

These soils are suited to most crops grown in the county and to pasture or trees. The hazards of erosion and soil blowing are moderate to severe in cultivated areas that are unprotected. The use of contour farming is not practical in places because of complex slopes. Capability unit IIe-3; woodland suitability group 3o1.

Hartland-Agawam complex, 8 to 15 percent slopes (HgC).—This complex of moderately sloping soils is made up of about 70 percent Hartland and 30 percent Agawam soils. The Agawam soil of this unit has the profile described as representative for the Agawam series, and the Hartland profile is similar to the one described as representative for the Hartland series, except that in places the upper part of the subsoil is thinner. The surface layer of Hartland soils is mainly silt loam, but ranges to very fine sandy loam. The surface layer of Agawam soils is mainly very fine sandy loam, but ranges to loam. The soils of this complex are on rolling landscapes of lake plains or dissected stream terraces. Individual areas are irregular in shape, and range from 5 to 50 acres.

Included with these soils in mapping were small areas of sandy Windsor soils and gravelly Howard soils, small spots where glacial till is observed within 40 inches of the surface, small areas that have a fine sandy loam surface layer, and spots where past erosion or soil blowing has exposed the subsoil.

These soils are suited to most crops grown in the county and to pasture or trees. The hazards of erosion or soil blowing are severe in cultivated areas that are unprotected. Slopes are usually short and complex, and the use of contour farming is often impractical. In these situations, close-growing crops should be favored. Capability unit IIIe-3; woodland suitability group 3r1.

Hartland-Agawam complex, 15 to 25 percent slopes (HgD).—This complex of moderately steep soils consists of about 60 percent Hartland and about 40 percent Agawam soils. Both soils have profiles similar to those described as representative for their respective series, except that the upper part of the subsoil is thinner in places. The surface layer of Hartland soils is mainly silt loam, but ranges to very fine sandy loam. The surface layer of Agawam soils is mainly very fine sandy loam, but ranges to loam. The soils of this complex are on hilly landscapes of lake plains and dissected stream terraces. Individual areas are irregular in shape, and range from 5 to 30 acres.

Included with this complex in mapping were small areas of sandy Windsor and gravelly Howard soils, spots where past erosion or soil blowing has exposed subsoil layers, and small areas of soils that have a fine sandy loam surface layer.

These soils are poorly suited to crops because of adverse slopes, and the severe hazards of erosion or soil blowing if they are left exposed. Lack of moisture is a problem in places in dry years. Tillage operations should largely be confined to renovation for hay and pasture. These soils are fairly well suited to trees. Capability unit IVe-3; woodland suitability group 3r2.

Herkimer Series

The Herkimer series consists of deep, well-drained to moderately well drained, medium-textured soils that formed in old alluvial fan deposits where side streams flow through regions of dark-colored calcareous shale and enter major valleys. These soils are nearly level to gently sloping. They are high to medium in lime.

In a representative profile the surface layer is very dark grayish-brown gravelly silt loam that has a noticeable amount of dark-colored shale fragments, and is 9 inches thick. The subsoil is dark grayish-brown, neutral, friable gravelly silt loam and is between depths of 9 and 46 inches. The soft, dark-colored shale fragments are common in the upper part of the subsoil, and increase to many in the lower part. The substratum begins at a depth of about 46 inches. It consists of dark grayish-brown, friable shaly loam that is neutral to a depth of 74 inches and calcareous below.

Some Herkimer soils have a seasonal high water table within 18 to 24 inches of the surface. In a large acreage of these soils, the water table is at a depth of 40 inches or more. Permeability is moderate in the surface and subsoil, and ranges from moderate to rapid in the substratum. Maximum rooting depth is 30 inches or more. Available water capacity is moderate. Available phosphorus is generally medium to low, and available potassium and nitrogen are medium. Reaction in the surface layer is medium acid to neutral in unlimed areas. Few limitations to the use of these soils for farming exist, other than the presence of some gravelly fragments and cobblestones on the surface.

Representative profile of Herkimer gravelly silt loam, 0 to 3 percent slopes, cultivated in town of Schuyler, 3/4 mile north of New York State Highway 5, 100 feet west of Woods Road:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2), grayish-brown (10YR 5/2) dry, gravelly silt loam; weak, medium, granular structure; friable; many fine roots; 15 percent gravel; 10 percent soft fragments of shale; slightly acid; abrupt, smooth boundary.

B21—9 to 31 inches, dark grayish-brown (10YR 4/2), brown to dark-brown (10YR 4/3) crushed, brown (10YR 5/3) dry and crushed, gravelly silt loam; weak, fine, subangular blocky structure; friable; common fine roots; many fine pores; 15 percent gravel; 10 percent soft fragments of shale; neutral; gradual, wavy boundary.

B22—31 to 46 inches, dark grayish-brown (10YR 4/2), brown to dark-brown (10YR 4/3) crushed, brown (10YR 5/3) dry and crushed, gravelly silt loam; weak, fine, subangular blocky structure; friable; few fine roots; common fine pores; very few, thin clay films in depressions on ped faces and in pores; 15 percent gravel; 20 percent soft fragments of black shale; neutral; gradual, wavy boundary.

C—46 to 75 inches, dark grayish-brown (10YR 4/2) crushed, shaly loam; massive; friable; few fine roots; 15 percent gravel; 30 percent weak fragments of dark-colored shale oriented horizontally; neutral; calcareous at a depth of 74 inches.

The solum ranges from 24 to 48 inches in thickness. The depth to carbonates ranges from 40 to 75 inches. The depth to bedrock is more than 40 inches. Hard, coarse fragments range from 5 to 30 percent. Soft fragments of dark-colored shale range from few to 30 percent in the upper part of the solum, and from 20 to 60 percent in the lower part of the B and C horizons. The upper horizons range from medium acid to neutral. Reaction increases with depth.

The Ap horizon ranges from black (10YR 2/1) to very dark grayish brown (2.5Y 3/2) in color. It is weak to moderate, granular in structure, and is very friable to friable. The B horizon has a color value the same or one unit higher than that of the Ap horizon and chroma is the same to two units higher. The B horizon is fine sandy loam to silt loam. It is very weak to moderate, very fine to medium, subangular blocky in structure. Clay films are lacking or cover less than 1 percent of the faces of peds. The C horizon ranges from very dark grayish brown (2.5Y 3/2) to dark yellowish brown (10YR 4/4) in color. It contains layers of dark-colored shale fragments and gravelly or shaly loams or silt loams in some profiles. It is weak, platy in structure or is structureless (massive), and is friable or loose.

Herkimer soils are often near Howard, Palmyra, Phelps, Fredon, and Halsey soils, all of which formed in glacial outwash. Herkimer soils contain more dark-colored shale, have darker colored sola, and lack the Bt horizons of Howard, Palmyra, and Phelps soils. They are drier than the somewhat poorly drained to poorly drained Fredon and the very poorly drained Halsey soils.

Herkimer gravelly silt loam, 0 to 3 percent slopes (HhA).—This level to nearly level soil is on the base of old alluvial fans where streams from regions of dark-colored calcareous shale enter major valleys. Individual areas are fan shaped, and range from 5 to 100 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of the moderately well drained phase of Herkimer soils and wetter Fredon soils, a few spots of Howard and Palmyra soils, and small areas where the surface layer is gravelly loam. In a few places red and green shale chips are a conspicuous part of the soil mass.

This well-drained soil is suited to most crops grown in the county and to hay, pasture, or trees. Few limitations to intensive cultivation exist, other than the presence of some gravelly fragments and cobblestones that interfere with precision cultivation of some vegetable crops. Capability unit I–1; woodland suitability group 2o1.

Herkimer gravelly silt loam, 3 to 8 percent slopes (HhB).—This gently sloping soil has a profile similar to the one described as representative for the series except that in places it contains a greater volume of hard gravelly fragments. It is on apex areas of old alluvial fans where streams from regions of dark-colored calcareous shale enter major valleys. Individual areas are fan shaped, and range from 5 to 80 acres.

Included with this soil in mapping were small areas of the moderately well drained phase of Herkimer soils, a few spots of Howard and Palmyra soils, and small areas where the surface layer is gravelly loam. In a few spots, red and green shale chips are a conspicuous part of the soil mass.

This well-drained soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Contour measures for control of erosion are generally easy to establish. Gravelly fragments and cobblestones interfere with precision cultivation of some vegetable crops. Capability unit IIe–7; woodland suitability group 2o1.

Herkimer gravelly silt loam, moderately well drained, 0 to 4 percent slopes (HkB).—This level to very gently sloping soil has a profile similar to the one described as representative for the series except that there are some mottles in the subsoil that were caused by a seasonal high water table. This soil is on areas of old alluvial fans where streams from regions of dark-colored calcareous shale enter major valleys. Individual areas are irregularly shaped, and range from 5 to 100 acres.

Included with this soil in mapping were small areas of well-drained Herkimer soils, and similar Phelps soils that contain few dark-colored shale chips. Also included, in low areas, were spots of wetter Fredon and Halsey soils. In a few places, red and green shale chips are a conspicuous part of the soil mass.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Slight wetness in places delays planting briefly in the spring. To provide more uniform drainage conditions in fields, random drainage of included wet areas is desirable in places. Gravelly fragments and cobblestones interfere with precision cultivation of some vegetable crops. Capability unit IIw–1; woodland suitability group 2o1.

Hilton Series

The Hilton series consists of deep, moderately well drained, medium-textured soils that formed in loamy glacial till derived mainly from sandstone and limestone. These soils are gently sloping to moderately sloping and are on upland till plains where some runoff water accumulates. They are medium in lime.

In a representative profile the surface layer is dark-brown silt loam that contains a noticeable amount of pebbles and is about 8 inches thick. It is underlain by a subsurface layer about 7 inches thick of brown, neutral, very friable gravelly fine sandy loam. At a depth of 15 inches is a partly leached upper part of the subsoil that consists of mottled, brown to dark-brown gravelly silt loam about 9 inches thick that is friable and slightly acid. Below a depth of 24 inches, the subsoil is mottled, brown to dark-brown gravelly heavy silt loam about 12 inches thick that is firm and slightly acid. At a depth of 36 inches this is underlain by a substratum of mottled, brown to dark-brown gravelly silt loam that is very firm and extends to a depth of 50 or more inches. It is neutral in the upper part and becomes calcareous below a depth of 45 inches.

Hilton soils have a seasonal high water table within 18 to 24 inches of the surface in spring and during wet periods. This water table is perched on the slowly permeable substratum. Maximum rooting depth is mainly 24 inches. Few roots extend below this depth. Available water capacity in the rooting zone is moderate. Available phosphorus is generally medium, and available potassium is high. Available nitrogen is generally medium. Reaction in the surface layer is strongly acid to neutral in unlimed areas. Aside from slope, a slight wetness is the principal limitation to the use of these soils for farming.

Representative profile of Hilton silt loam, 8 to 15 percent slopes, in a hayfield in town of Frankfurt, 90 feet north of Higby Road, and 0.13 mile west of the intersection of Higby and Graffenburg Roads:

Ap—0 to 8 inches, dark-brown (10YR 3/3), brown to dark-brown (10YR 4/3) crushed, silt loam; weak, fine, granular structure; friable; many fine roots; 15 percent gravel; neutral; abrupt, smooth boundary.

B2—8 to 15 inches, brown (7.5YR 5/4) gravelly fine sandy loam; weak, medium, platy structure and weak, medium, subangular blocky; very friable; common fine roots; 25 percent gravel; neutral; gradual, wavy boundary.

IIB&A—15 to 24 inches, brown to dark-brown (7.5YR 4/4) gravelly silt loam; few, fine, faint, strong-brown (7.5YR 5/6) mottles; weak, medium and fine, subangular blocky structure; friable; common fine roots; few, small, red and black shale chips; 25 percent gravel; grayish-brown (10YR 5/2) coatings on ped faces; slightly acid; gradual, wavy boundary.

IIB2t—24 to 36 inches, brown to dark-brown (7.5YR 4/2) gravelly heavy silt loam; few, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, angular blocky structure and moderate, medium, subangular blocky; firm; common medium pores; red, green, and black shale chips scattered throughout horizon; few, large, soft, reddish-brown concretions; thin clay films on ped surfaces and in pores; 20 percent gravel; slightly acid; gradual, wavy boundary.

C—36 to 50 inches, brown to dark-brown (7.5YR 4/2) gravelly silt loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; massive; very firm; red, green, and black shale chips scattered throughout the horizon; 30 percent gravel; neutral in the upper part becoming moderately alkaline and calcareous below a depth of 45 inches.

The solum ranges from 24 to 42 inches in thickness. The depth to sandstone bedrock ranges from 40 inches to many feet. Coarse fragments range from 5 to 15 percent in the surface, and increase with depth up to 35 percent.

The upper B horizon ranges from very dark grayish-brown (10YR 3/2) to brown (7.5YR 5/2) in color. Reaction is strongly acid to neutral, depending on liming practices. The A2 horizon is fine sandy loam to loam, and ranges from yellowish brown (10YR 5/4) to dark reddish gray (5YR 4/2) in color. High-chroma mottles are in places in this horizon. This horizon is platy or weak, blocky in structure. Reaction is strongly acid to neutral.

The B horizons are silt loam to loam, and range from dark brown (10YR 4/3) to reddish brown (5YR 5/4) in color. High-chroma mottles are fine to coarse and few to many. Thin clay films are on ped surfaces and in pores of the B2t horizon. This horizon is medium to coarse, angular to subangular blocky in structure. Reaction is medium acid to neutral.

The C horizon is firm to very firm loam to silt loam in the fine earth, ranging from dark grayish-brown (10YR 4/2) to reddish-brown (5YR 5/4) in color. High-chroma mottles are in this horizon. Reaction is neutral to moderately alkaline. The soil becomes calcareous with depth.

Hilton soils in Herkimer County have silt loam B&C horizons that are not within the defined range for the series, but this difference does not alter the usefulness or behavior of the soils.

Hilton soils formed in similar materials and make up a drainage sequence with the well-drained Ontario, the somewhat poorly drained Appleton, and the poorly to very poorly drained Lyons soils. Hilton soils are similar to Lima and Conesus soils. They have a thicker, more strongly expressed B&A horizon than Lima soils, and contain more sand and less silt in the Bt horizon than Conesus soils.

Hilton silt loam, 3 to 8 percent slopes (HIB).—This gently sloping soil is on rounded hilltops and foot slopes on till plains where runoff is retarded somewhat or accumulates to some extent. Individual areas are irregular in shape, and range from 5 to 25 acres.

Included with this soil in mapping were small areas of wetter Appleton and Lyons soils in low areas and along drainageways, areas of better drained Ontario soils on knolls, and small areas that have a fine sandy loam or loam surface layer. Small areas of similar Lima soils were included in the town of Litchfield, and Conesus soils in the eastern part of the town of Frankfurt.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Also, slight wetness in places delays planting briefly in the spring. Capability unit IIe-4; woodland suitability group 2o1.

Hilton silt loam, 8 to 15 percent slopes (HIC).—This moderately sloping soil is on side slopes of upland till landscapes where some runoff accumulates. Individual areas are irregular in shape, and range from 5 to 25 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of better drained Ontario soils on higher positions, wetter Appleton and Lyons soils in low areas and around seeps, and areas where the surface layer is fine sandy loam or loam. Also included were small areas of similar Lima soils in the town of Litchfield, and Conesus soils in the eastern part of the town of Frankfort.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Slight wetness in places delays planting briefly in the spring. Capability unit IIIe-4; woodland suitability group 2o1.

Hinckley Series

The Hinckley series consists of deep, excessively drained, coarse-textured soils that formed in very gravelly and cobbly glacial outwash derived mainly from granitic rocks and some sandstone and limestone. These soils are nearly level to very steep and are on glacial outwash terraces, deltas, and kames. They are very low and low in lime.

In a representative profile (fig. 8) the surface layer is very dark grayish-brown gravelly loamy sand about 9 inches thick. The subsoil, between depths of 9 and 28 inches, is brown to dark-brown, very friable gravelly loamy sand that is medium acid in the upper part and slightly acid in the lower part. The substratum is dark grayish-brown to very dark grayish-brown, very friable very gravelly loamy sand that extends to a depth of 40 inches. Below this, to a depth of 70 or more inches, the substratum consists of loose, slightly acid, stratified sand and gravel that is grayish brown to dark grayish brown.

The water table in Hinckley soils is normally several feet below the surface, but locally it may be encountered at a depth of 40 inches. Permeability is rapid. Maximum rooting depth is mainly 30 inches. Available water capacity is low or very low. Available phosphorus and potassium are low. Available nitrogen is medium. Reaction in the surface layer is strongly acid to medium acid in unlimed areas. Aside from slope, droughtiness and low fertility are the principal limitations to use of these soils for farming. The soils are a good source of sand and gravel.

Figure 8.—Profile of Hinckley gravelly loamy sand, 0 to 3 percent slopes. These soils formed in very gravelly and cobbly glacial outwash.

Representative profile of Hinckley gravelly loamy sand, 0 to 3 percent slopes, in brushy, idle land in town of Russia, 0.3 mile southeast of intersection of Simpson and Norris Roads:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2), dark-brown (10YR 3/3) rubbed, gravelly loamy sand; weak, medium and fine, granular structure; very friable; many fine roots; 15 percent gravel; medium acid; abrupt, smooth boundary.

B21ir—9 to 14 inches, brown to dark-brown (7.5YR 4/4) gravelly loamy sand; moderate, medium, granular structure; very friable; common fine roots; 15 to 20 percent gravel; medium acid; clear, wavy boundary.

B22ir—14 to 28 inches, brown (7.5YR 5/4) gravelly loamy sand; weak, fine and medium, granular structure; very friable; common to few fine roots; 15 percent gravel; slightly acid; clear, wavy boundary.

IIC1—28 to 40 inches, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) very gravelly loamy sand; single grain; very friable; few fine roots; 50 percent gravel and cobblestones; slightly acid; clear, wavy boundary.

IIC2—40 to 70 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) stratified sand and gravel; single grain; loose; few fine roots; 55 percent gravel and cobblestones; slightly acid.

The solum ranges from 15 to 30 inches in thickness. The depth to free carbonates ranges from 48 to 180 inches. Coarse fragments make up 35 percent or more of the profile, and medium and coarse sands are dominant. Hues are 7.5YR and 10YR.

The Ap horizon has color values of 3 and 4; chroma is 2 or 3. The texture is loamy sand or sand, both gravelly and nongravelly. Reaction is strongly acid to medium acid. Where soils have not been plowed, a very dark grayish-brown A1 horizon, 1 to 2 inches thick, and a light grayish-brown A2 horizon, 1 to 3 inches thick, are present in place of the Ap horizon.

Hues in the B horizon are dominantly 7.5YR in the upper part and fade to 10YR with depth. The B horizon has color values of 4 and 5; chroma is 4 to 6. It is loamy sand and gravelly and cobbly sand and loamy sand, and is very gravelly or very cobbly in some parts. Reaction is strongly acid to slightly acid.

The C horizon is commonly stratified sand and gravel. Reaction is medium acid to neutral, with free carbonates deeper than 48 inches.

Hinckley soils in Herkimer County are commonly less acid than is defined as the range for the series, but this difference does not alter their usefulness or behavior.

Hinckley soils are near Windsor, Howard, Fredon, and Halsey soils, all of which formed in outwash or deltaic deposits. They have a high content of gravelly fragments and cobblestones, in contrast to sandy Windsor soils, which are essentially free of coarse fragments. Hinckley soils are coarser in texture and lack the Bt horizon of Howard soils. They are coarser in texture and much drier than Fredon and Halsey soils.

Hinckley gravelly loamy sand, 0 to 3 percent slopes (HmA).—This level or nearly level soil is on flatter areas of glacial outwash terraces and deltas. Individual areas are irregularly shaped and range from 5 to 100 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of sandy Windsor soils, small spots of wetter Fredon and Halsey soils in some depressions and along drainageways, and small areas of finer textured Howard soils. Other inclusions, mainly in the northern part of the town of Russia, were small areas that have a fine sandy loam surface layer.

Lack of moisture limits the use of this soil for farming. Lime and fertilizer applications are rapidly leached from the soil, and smaller but more frequent applications will give better response. The soil provides some early pasture, and has fair suitability for trees. Capability unit IVs–1; woodland suitability group 5s1.

Hinckley gravelly loamy sand, 3 to 8 percent slopes (HmB).—This gently sloping soil is on smoothly sloping or undulating areas of glacial outwash terraces and deltas. Individual areas are irregular in shape, and range from 5 to 100 acres.

Included with this soil in mapping were small areas of sandy Windsor soils, spots of wetter Fredon and Halsey soils in depressions and along drainageways, and small areas of finer textured Howard soils. Other inclusions, mainly in the northern part of the town of Russia, were small areas of soils that have a fine sandy loam surface layer.

This soil is poorly suited to farming because of droughtiness and low fertility. The hazard of erosion is slight in cultivated areas that are unprotected. The soil provides some early pasture, and is fair for trees. Capability unit IVs–1; woodland suitability group 5s1.

Hinckley gravelly loamy sand, 8 to 15 percent slopes (HmC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that the subsoil is thinner in places. It is on escarpments and rolling kamy areas of glacial outwash terraces and deltas. Individual areas are irregular in shape, and range from 5 to 100 acres.

Included with this soil in mapping were small areas of sandy Windsor soils and finer textured Howard soils, and small spots of Fredon and Halsey soils in some depressions and along drainageways. In the northern part of the town of Russia, some areas of soils that have a fine sandy loam surface layer were included.

Droughtiness prohibits the use of this soil for farming. The soil is poorly suited to pasture. It is suited to tree species that will tolerate dryness. Capability unit VIIs–2; woodland suitability group 5s1.

Hinckley and Windsor soils, 15 to 25 percent slopes (HnD).—The soils in this group are moderately steep. Some of the areas consist only of the Hinckley soil or the Windsor soil, and other areas are made up of both soils. Both have profiles similar to the ones described as representative for their respective series except that the subsoil is thinner in places. Also, they have sand surface layers in some areas. These soils are on escarpments and kamy areas of glacial outwash terraces and kames and sandy deltas in old glacial lake areas. Individual areas are irregular in shape or are long and narrow along terrace escarpments, and range from 5 to 60 acres.

Included with this unit in mapping were small areas of finer textured Howard soils and areas of wetter Fredon and Halsey soils in some depressions and along drainageways.

Droughtiness and slope prohibit the use of these soils for farming. The soils are poorly suited to pasture. They are suited to tree species that will tolerate dryness. If these soils are left without cover, they are susceptible to water erosion and a severe hazard of soil blowing. Capability unit VIIs–2; woodland suitability group 5s2.

Hinckley and Windsor soils, 25 to 70 percent slopes (HnF).—The soils in this group are steep to very steep. Some areas are made up only of the Hinckley soil or the Windsor soil, and other areas are made up of both soils. Both soils have profiles similar to those described as representative for their respective series except that the subsoil is thinner in places. Also, areas with a sand or gravelly sand surface layer are common. These soils are on escarpments and kamy areas of glacial outwash terraces, and sandy deltas in old glacial lakes. Individual areas are long and narrow on terrace escarpments or irregularly shaped in other landscapes, and range from 5 to 50 acres.

Included with this unit in mapping were small areas of wetter Fredon and Halsey soils in some depressions and along drainageways.

Droughtiness and slope prohibit the use of these soils for farming or pasture. They are suited to tree species that are tolerant of dryness, and to some types of recreational use. If these soils are left without cover, they are susceptible to severe hazards of water erosion and soil blowing. Capability unit VIIe–1; woodland suitability group 5s3.

Honeoye Series

The Honeoye series consists of deep, well-drained, medium-textured soils that formed in firm, strongly calcareous, loamy glacial till. These soils are gently sloping to steep and are on upland-till landscapes. They are high in lime. In many areas the drumlinlike landform is east-west oriented.

In a representative profile the surface layer is dark-brown silt loam about 6 inches thick. The subsurface layer is brown, neutral, friable silt loam and extends to a depth of 9 inches. The upper part of the subsoil is brown to dark brown in color and friable. The subsoil is neutral gravelly silt loam to a depth of about 16 inches. Between depths of 16 and 27 inches it is neutral very gravelly silt loam that, in places, has calcareous spots around limestone grains. The calcareous substratum, at a depth of 27 inches, is brown and dark-brown gravelly silt loam. It is firm to a depth of 40 inches and very firm at depths of 40 to 66 inches or more.

The water table in Honeoye soils is at a depth of more than 30 inches. Seasonally it is perched on the slowly permeable substratum. Maximum rooting depth is mainly 20 to 30 inches, depending on the depth to the very firm substratum. Available water capacity in the rooting zone is moderate to high. Ability of the soil to supply phosphorus is generally medium, and ability to supply potassium is high. Available nitrogen is generally medium. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Aside from steep slopes and the hazard of erosion, there are few limitations to use of these soils for farming.

Representative profile of Honeoye silt loam, 8 to 15 percent slopes, in a pasture in town of Columbia, 1 mile south of Getman Corners, 200 feet west of New York State Highway 28:

Ap—0 to 6 inches, dark-brown (10YR 3/3) to dark yellowish-brown (10YR 3/4) rubbed, silt loam; moderate, medium and fine, granular structure; very friable; 14 percent gravel; many fine roots; neutral; abrupt, smooth boundary.

B&A—6 to 9 inches, dark-brown (10YR 4/3) light silt loam; moderate, thick, platy structure parting to weak, fine, subangular blocky; friable; common fine roots; common medium pores and clay linings; ped exteriors have brown (10YR 5/3) light silt loam coatings up to 4 millimeters thick; 13 percent gravel; neutral; abrupt, irregular boundary.

B21t—9 to 16 inches, dark-brown (10YR 4/3) gravelly silt loam; weak, medium and fine, subangular blocky structure; friable; common fine roots; common medium and fine pores; few thin clay films on peds and in pores; 18 percent gravel; neutral; clear, wavy boundary.

B22t—16 to 27 inches, brown (10YR 4/3) very gravelly silt loam; weak, fine, subangular blocky structure; friable; common fine roots; many medium and fine pores; pockets of very dark brown (10YR 2/2) shale chips; 40 percent gravel and shale chips; thick, patchy clay films on gravel grains and peds; neutral; calcareous around limestone grains; abrupt, wavy boundary.

C1—27 to 40 inches, brown (10YR 5/3) and dark-brown (10YR 4/3) gravelly light silt loam; massive; firm; few fine roots; 28 percent gravel; calcareous; moderately alkaline; abrupt, wavy boundary.

C2—40 to 66 inches, brown (10YR 5/3) gravelly silt loam; weak, thick, platy structure; very firm; 35 percent gravel and cobblestones; calcareous; moderately alkaline.

The solum ranges from 18 to 32 inches in thickness. Coarse fragments that consist of limestone, sandstone, and some siltstone, shale, and granite cobblestones range from 10 to 30 percent in the solum and from 20 to 50 percent in the C horizon. Most stones have been removed from the surface to facilitate farming operations.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to brown (7.5YR 5/2) in color, and is weak to moderate, granular in structure. Reaction is slightly acid to neutral. The B&A horizon is fine sandy loam to silt loam. Reaction in this horizon is neutral to slightly acid. Color ranges from grayish brown (10YR 5/2) to brown (7.5YR 5/4).

The B2t horizon is brown (10YR 4/3) to dark-brown (7.5YR 4/4) loam or silt loam. Clay films are on the ped surfaces and gravel grains in this horizon. Structure ranges from angular to subangular blocky, and reaction is neutral to mildly alkaline.

The C horizon is firm to very firm gravelly to stony fine sandy loam, loam, or silt loam. Color ranges from grayish brown (2.5Y 5/2) to brown (7.5YR 5/4). The material in this horizon is calcareous.

Honeoye soils formed in similar material and make up a drainage sequence with the moderately well drained Lima, the somewhat poorly drained Appleton, and the poorly to very poorly drained Lyons soils. They are also near Ontario, Lansing, Mohawk, and Wassaic soils. Honeoye soils have a thinner solum than Ontario and Lansing soils, and they lack the dark colors and dark-colored shale content of Mohawk soils. They are more than 40 inches deep over bedrock, as compared to Wassaic soils, which range from 20 to 40 inches in depth.

Honeoye silt loam, 3 to 8 percent slopes (HoB).—This gently sloping soil is on rounded hilltops, hillsides, and drumlins on upland till plains. Individual areas are long, and range from 5 to 76 acres.

Included with this soil in mapping were small areas of wetter Lima, Appleton, and Lyons soils on lower areas and in depressions; small areas of Ontario soils in the town of Litchfield; spots of Lansing and Mohawk soils in the towns of German Flatts and Stark; and some moderately deep Wassaic soils where limestone bedrock is at a depth of less than 40 inches.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Crops grown in this soil respond well to fertilizer applied according to soil tests. Capability unit IIe-1; woodland suitability group 2o1.

Honeoye silt loam, 8 to 15 percent slopes (HoC).—This moderately sloping soil is on hillsides and drumlins on upland till plains. Areas are long, and range from 5 to 75 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of wetter Lima, Appleton, and Lyons soils in lower areas and along drainageways; spots of an Ontario soil in the towns of Litchfield and Mohawk; and areas of Lansing soils in the towns of German Flatts and Stark. Also included, in areas where limestone bedrock is at a depth of less than 40 inches, were areas of moderately deep Wassaic soils.

This soil is suited to crops and to hay, pasture, or trees; but if it is cultivated and not protected, the hazard of erosion is moderate to severe. Crops grown in this soil respond well to fertilizer applied according to soil tests. The soil is well suited to high-yielding varieties of alfalfa. Capability unit IIIe-1; woodland suitability group 2o1.

Honeoye silt loam, 15 to 25 percent slopes (HoD).—This moderately steep soil has a profile similar to that described as representative of its series except that the subsurface layer is usually incorporated into the plow layer. It occupies hillsides and drumlins on upland till plains. Areas are long, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of wetter Lima, Appleton, and Lyons soils around seeps and along drainageways; spots of Ontario soils in the town of Litchfield; areas of Mohawk and Lansing soils in the towns of German Flatts and Stark; and areas of moderately deep Wassaic soils where limestone bedrock at a depth of less than 40 inches.

Moderately steep slopes limit the use of this soil for crops. The soil is hazardous to work, and the hazard of erosion is severe in cultivated areas that are not protected. Tillage should be confined largely to renovation for hay or pasture. The soil is well suited to pasture and to trees. Capability unit IVe-1; woodland suitability group 2r1.

Honeoye and Lansing silt loams, 25 to 35 percent slopes (HrE).—The soils in this undifferentiated group are steep. Each has a profile similar to that described as representative of its series except that the surface layer is thicker in undisturbed areas. These soils occupy side slopes in upland till landscapes and sharp breaks along major streams. Areas are mostly long, and range from 5 to 100 acres.

Included with this unit in mapping were small areas of Mohawk and Ontario soils. Also included, in the towns of Russia, Norway, and Salisbury, were spots of deep, well drained to moderately well drained Broadalbin soils that have a fragipan, and spots of coarser textured, well-drained Canton soils.

These soils are too steep for crops, but are well suited to trees, and in places are suited to pasture. Runoff is rapid, and the hazard of erosion is severe in cultivated areas that are left unprotected. Capability unit VIe-1; woodland suitability group 2r1.

Honeoye and Mohawk very stony silt loams, 0 to 25 percent slopes (HsD).—The soils in this group are nearly level to moderately steep. Some areas in this group are made up only of the Honeoye soil, other areas only of the Mohawk soil, and still others of both soils. Each soil has a profile similar to that described as representative of its series except that the soils have not been plowed and have a thinner surface layer. Large stones are about 5 to 30 feet apart, and occupy about 1.5 to 50 cubic yards per acre-foot. These soils are on rounded hilltops and side slopes of upland till landscapes. Areas range from 5 to 50 acres.

Included with these soils in mapping were small areas of stony and nonstony Honeoye and Mohawk soils. Also included, in lower areas and in depressions, were spots of wetter Lima, Appleton, Manheim, Lyons, and Ilion soils.

These soils are too stony for crops. They provide some pasture, and are well suited to trees and to some types of recreational use. Capability unit VIs-1; woodland suitability group 2r1.

Hornell Series

The Hornell series consists of moderately deep, somewhat poorly drained to moderately well drained, medium-textured soils that have a fine-textured subsoil. They formed in thin till deposits derived mainly from underlying shale bedrock or partly in shale residuum. Depth to weakly consolidated shale bedrock is 20 to 40 inches. These soils are nearly level to moderately sloping and are on upland till plains. They are low in lime.

In a representative profile the surface layer is dark grayish-brown silt loam about 6 inches thick. The upper part of the subsoil is mottled, brown shaly silty clay loam about 8 inches thick that is firm and strongly acid. Between depths of 14 and 22 inches the subsoil is prominently mottled, light brownish-gray, strongly acid, firm shaly silty clay. It rests on bedrock of dark grayish-brown shale at a depth of 22 inches.

Hornell soils have a seasonal high water table within 6 to 24 inches of the surface. This water table is perched on the very slowly permeable subsoil. Maximum rooting depth is mainly 15 to 20 inches. Available water capacity in the rooting zone is moderate. Available phosphorus and potassium are generally medium. Available nitrogen is high, but it is released slowly in spring when the soils are wet and cold. Reaction in the surface layer is strongly acid in unlimed areas. Excess water, strong acidity, and the difficulty of maintaining good tilth are the principal limitations to the use of these soils for farming.

Representative profile of Hornell silt loam, 3 to 8 percent slopes, in a meadow in town of Danube, 0.7 mile south-southwest of junction of New York State Route 167 and Newville Road:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; many fine roots; 5 percent shale fragments; slightly acid; clear, smooth boundary.

B21—6 to 14 inches, brown (10YR 5/3) shaly silty clay loam that has dark grayish-brown (10YR 4/2) ped faces; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine, subangular blocky structure; firm; common fine roots; 15 percent shale fragments; strongly acid; clear, smooth boundary.

B22g—14 to 22 inches, shaly silty clay that has light brownish-gray (2.5Y 6/2) ped interiors, dark grayish-brown (2.5Y 4/2) ped faces; many (30 percent), medium and coarse, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; strong, medium and coarse, prismatic structure parting to coarse, blocky; firm; few fine roots; 20 percent shale fragments; strongly acid; clear, wavy boundary.

B—22 inches +, dark grayish-brown (2.5Y 4/2) shale; strongly acid.

The solum ranges from 20 to 36 inches in thickness. The depth to bedrock ranges from 20 to 40 inches. Reaction is strongly acid. Coarse fragments range from 5 to 20 percent in the upper horizons and from 20 to 35 percent in the lower horizons, and shale fragments are dominant. Hue ranges from 10YR to 5Y. The Ap horizon has color values of 4 and 5; chroma is 2 or 3. The B horizon is silty clay loam to clay. Near the maximum depth for the series, a B3 and C horizon are present in places, while profiles near the shallow end of the range generally have a B2 horizon resting on rock. Ped interiors in the B horizon have color values of 4 to 6; chroma is 2 to 4. Chroma in ped faces is 2 or less. Mottling is common or many, medium or coarse, distinct or prominent. The bedrock is commonly soft shale but layers of hard shale or sandstone are in some profiles.

Hornell soils formed in similar material and make up a drainage sequence with the poorly drained to somewhat poorly drained Allis soils. They are also near Manlius, Nassau, Manheim, and Appleton soils. Hornell soils are wetter, and have finer textured B horizons than the Manlius soils and shallow Nassau soils. They are more acid, have finer textured B horizons, and are moderately deep, in contrast to the deep Manheim and Appleton soils. Hornell soils are similar to Lockport soils that formed in thin till derived mainly from red shale.

Hornell silt loam, 0 to 3 percent slopes (HtA).—This level or nearly level soil is on hilltops or foot slopes where runoff is slow or water accumulates. Individual areas are irregular in shape, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of similar but wetter Allis soils in depressions, small spots of deeper Manheim and Appleton soils, small areas of soils that have a silt loam subsoil, and still other soils that have a silty clay loam surface layer.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, planting is delayed and the choice of crops limited. Maintenance of tilth can be a problem. This soil clods and puddles easily if worked at the wrong moisture content. Capability unit IIIw–2; woodland suitability group 3w3.

Hornell silt loam, 3 to 8 percent slopes (HtB).—This gently sloping soil is on foot slopes of upland till landscapes where runoff accumulates. Individual areas are irregular in shape, and range from 3 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but wetter Allis soils on lower areas and in depressions, spots of deeper Manheim and Appleton soils, a few small areas of soils where the surface layer is silty clay loam, and other soils that have a silt loam subsoil. Also included, along breaks in the bedrock-controlled landscapes, were narrow areas of better drained Manlius and Nassau soils.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, planting is delayed and the choice of crops limited. The hazard of erosion is moderate in cultivated areas that are unprotected. Good tilth is difficult to maintain. The soil clods and puddles easily if worked at the wrong moisture content. Capability unit IIIw–4; woodland suitability group 3w3.

Hornell silt loam, 8 to 15 percent slopes (HtC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that the upper part of the subsoil is thinner in places. It occupies foot slopes of upland till landscapes where runoff water accumulates. Individual areas are elongated, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of similar but wetter Allis soils around seeps and along drainageways, spots where the depth to bedrock is less than 20 inches, other soils that are deeper than 40 inches, and small areas of soils that have a silty clay loam surface layer. Also included, along breaks in the bedrock-controlled landscapes, were narrow areas of better drained Manlius and Nassau soils.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is severe in cultivated areas that are unprotected. Unless drained, planting is delayed in places and the choice of crops is limited. Good tilth is difficult to maintain. This soil clods and puddles easily if tilled at the wrong moisture content. Capability unit IIIe–6; woodland suitability group 3w4.

Howard Series

The Howard series consists of deep, well-drained to somewhat excessively drained, medium-textured and moderately coarse textured, gravelly soils that formed in very gravelly glacial outwash derived mainly from sandstone, limestone, and shale. They are nearly level to very steep and are on glacial outwash terraces, kames, and deltas. These soils are medium in lime.

In a representative profile (fig. 9) the surface layer is very dark brown gravelly silt loam about 8 inches thick. It is underlain by a leached subsurface layer of brown to dark-brown, medium acid, very friable gravelly sandy loam that extends to a depth of about 13 inches. The subsoil is very dark grayish-brown, medium acid, friable very gravelly sandy loam about 16 inches thick. The substratum begins at a depth of 29 inches and extends to a depth of 50 or more inches. It consists of very dark grayish-brown very gravelly loamy sand that is loose and neutral.

The water table in Howard soils is normally at a depth of several feet, but in places it fluctuates to within 42 inches of the surface. Permeability of the surface layer and subsoil ranges from moderate to rapid, and permeability of the substratum is very rapid. Maximum rooting depth is not restricted, but is mainly 30 inches. Available water capacity is moderate to low. Available phosphorus and potassium are medium to low. Available nitrogen is generally medium. Reaction in the surface layer is strongly acid to slightly acid in unlimed areas. Other than slope, lack of moisture is one of the principal limitations to use of these soils for farming. In many areas the soils are a good source of sand and gravel.

Figure 9.—**Profile of Howard gravelly silt loam, 0 to 3 percent slopes. These soils formed in stratified sand and gravel.**

Representative profile of Howard gravelly silt loam, 0 to 3 percent slopes, in a cultivated field in town of Newport, 70 feet northeast of intersection of New York State Highway 28 and White Creek Road:

Ap—0 to 8 inches, very dark brown (10YR 2/2), dark grayish-brown (10YR 4/2) dry, gravelly silt loam; weak, medium and fine, granular structure; very friable; many fine and medium roots; many medium pores; 25 percent gravel; neutral (area recently limed); abrupt, smooth boundary.

A2—8 to 13 inches, brown to dark-brown (10YR 4/3) gravelly sandy loam; weak, medium and fine, subangular blocky structure; very friable; many fine roots; many medium pores; scattered, washed sand grains; 25 percent gravel; medium acid; gradual, irregular boundary.

B2t—13 to 29 inches, very dark grayish-brown (10YR 3/2) very gravelly sandy loam; weak, medium, subangular blocky structure and structureless (single grain); very friable; few fine roots; common medium and fine pores; scattered clay films on gravel grains and in pores; ped coats of grayish brown (10YR 5/2) in upper 4 inches; 55 percent gravel and cobblestones; medium acid; gradual, irregular boundary.

C—29 to 50 inches, very dark grayish-brown (10YR 3/2) very gravelly loamy fine sand, single grain; loose; few fine roots; 65 percent gravel and cobblestones; neutral.

The solum ranges from 24 to 50 inches in thickness. In most profiles, the depth to free carbonates is below 40 inches, but generally within 60 inches. Hue ranges from 7.5YR to 2.5Y. The Ap horizon ranges from dark brown (7.5YR 3/2) to brown (10YR 4/3) in color. It is silt loam to sandy loam. Reaction is strongly acid to neutral, depending on liming. Coarse fragments in the Ap, A2, and A&B horizons range from 15 to 35 percent.

The A2 horizon ranges from brown (7.5YR 5/4) to dark brown (10YR 4/3) in color. It is silt loam to sandy loam. This horizon ranges from granular to weak, subangular blocky in structure. Reaction is strongly acid to slightly acid.

The B2t horizon ranges from dark brown (7.5YR 3/2) to yellowish brown (10YR 5/4) in color, and is silt loam to sandy loam to sandy clay loam in texture. The horizon is structureless (single grain) or structure is weak, subangular blocky. Reaction is medium acid to neutral. Coarse fragments make up more than 35 percent of this horizon.

The C horizon consists of very gravelly loamy sand or stratified sand, silt, and gravel that are neutral or mildly alkaline, and contain an abundance of dark-colored shale fragments that darken the horizon. Coarse fragments throughout the profile consist mostly of well-rounded gravel and cobblestones. They are a mixture of black and gray shale, sandstone, limestone, and some gneiss and granite.

Howard soils formed in the same material and make up a drainage sequence with the moderately well drained Phelps, the somewhat poorly to poorly drained Fredon, and the very poorly drained Halsey soils. They are also near Palmyra, Hinckley, Herkimer, Hartland, and Agawam soils. Howard soils have more coarse fragments in the Bt horizon than Palmyra soils, and usually have a thicker solum. They have a finer textured solum than Hinckley soils. Howard soils have a Bt horizon that is not present in Herkimer soils, and lack the dark-colored shale content of Herkimer soils. Howard soils have a Bt horizon and a high content of coarse fragments lacking in Hartland and Agawam soils.

Howard gravelly fine sandy loam, 0 to 3 percent slopes (HuA).—This level or nearly level soil has a profile similar to the one described as representative for the series except that the surface layer is coarser in texture. It is on the flatter areas of glacial outwash terraces. Individual areas are irregularly shaped, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of wetter Phelps, Fredon, and Halsey soils in low areas and along drainageways, spots of Howard gravelly silt loam, and a few small areas of coarser Hinckley soils in the towns of Newport, Russia, and Norway.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. This soil can be tilled early, but it is droughty. Applied lime and fertilizer are rapidly leached from this soil, and smaller but more frequent applications will give better response. Capability unit IIs–1; woodland suitability group 2o2.

Howard gravelly fine sandy loam, 3 to 8 percent slopes (HuB).—This gently sloping soil has a profile similar to the one described as representative for the series except that the surface layer is coarser in texture. It is on undulating areas of glacial outwash terraces or smoothly sloping deltaic areas. Individual areas are irregularly shaped, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of wetter Phelps, Fredon, and Halsey soils in depressions and narrow bands along drainageways, spots of Howard gravelly silt loam, and a few spots of coarser textured Hinckley soils in the towns of Russia, Newport, and Norway.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. This soil can be tilled early, but it is droughty. The hazard of erosion is slight in cultivated areas that are unprotected. Applied lime and fertilizer are rapidly leached from this soil, and smaller but more frequent applications will give better response. Capability unit IIs–1; woodland suitability group 2o2.

Howard gravelly fine sandy loam, 8 to 15 percent slopes (HuC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that it has a coarser textured surface layer. It is on terrace breaks of glacial outwash deposits. Individual areas are long and narrow, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of wetter Phelps, Fredon, and Halsey soils in low areas and in narrow bands along drainageways, spots of Howard gravelly silt loam, and a few small areas of coarser textured Hinckley soils in the towns of Newport, Russia, and Norway.

This soil is poorly suited to farming, hay, or pasture, because it is very droughty. The hazard of erosion is moderate in cultivated areas that are unprotected. Applied lime and fertilizer are rapidly leached from this soil, and smaller but more frequent applications will give better response. This soil is fairly well suited to tree species that are deep rooted and tolerate dryness. Capability unit IIIe–2; woodland suitability group 2o2.

Howard gravelly silt loam, 0 to 3 percent slopes (HvA).—This level to nearly level soil is on flatter areas of glacial outwash terraces. Individual areas are irregularly shaped, and range from 5 to 50 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of wetter Phelps, Fredon, and Halsey soils in low areas and depressions, spots of Howard gravelly fine sandy loam, a few small areas of Herkimer soils along the Mohawk Valley, and a few spots of Hartland and Agawam soils in the town of Russia.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. This soil can be tilled early, but it is slightly droughty. Surface gravel interferes with precision cultivation of some vegetable crops in places. Capability unit IIs–1; woodland suitability group 2o2.

Howard gravelly silt loam, 3 to 8 percent slopes (HvB).—This gently sloping soil is on undulating areas of glacial outwash terraces or smoothly sloping deltaic areas. Individual areas are irregularly shaped, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of wetter Phelps, Fredon, and Halsey soils in depressions and in narrow bands along drainageways, spots of Howard gravelly fine sandy loam, a few small areas of Herkimer soils along the Mohawk Valley, and a few spots of Hartland and Agawam soils in the town of Russia.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. This soil can be tilled early, but it is slightly droughty. The hazard of erosion is slight in cultivated areas that are unprotected. Surface gravel interferes with precision cultivation of some vegetable crops in places. Capability unit IIs–1; woodland suitability group 2o2.

Howard gravelly silt loam, 8 to 15 percent slopes (HvC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that the subsurface layer is thinner in places. It is on terrace breaks of glacial outwash deposits. Individual areas are long and narrow, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of wetter Phelps, Fredon, and Halsey soils in depressions and in narrow bands along drainageways, spots of Howard gravelly fine sandy loam, a few small areas of Herkimer soils along the Mohawk Valley, and a few spots of Hartland and Agawam soils in the town of Russia.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate in cultivated areas that are unprotected. It is slightly droughty. High-yield varieties of alfalfa are fairly well suited to this soil. Capability unit IIIe–2; woodland suitability group 2o2.

Howard and Palmyra soils, 15 to 25 percent slopes (HwD).—The soils in this group are moderately steep. Some areas are made up only of Howard soils, others only of Palmyra soils, and still others of both soils. Both soils have profiles similar to those described as representative for their respective series except that the subsurface layers are thinner in places. Surface textures are gravelly silt loam or gravelly fine sandy loam. These soils are on terrace escarpments and kamy areas of glacial outwash deposits. Individual areas are irregularly shaped or long and narrow, and range from 5 to 30 acres.

Included with this unit in mapping were small areas of wetter Phelps and Fredon soils in low areas. Also, in the towns of Russia, Newport, and Norway, a few spots of coarser textured Hinckley soils were included.

These soils are poorly suited to farming because of droughtiness, moderately steep slopes, and the severe hazard of erosion. Complex slopes are common, and the use of contour measures to conserve moisture and control erosion is not feasible in many places. These soils are well suited to early pasture and trees. Capability unit IVe-1; woodland suitability group 2r2.

Hudson Series

The Hudson series consists of deep, moderately well drained, medium-textured soils that have moderately fine textured subsoils. These soils formed in clayey lacustrine sediment 40 or more inches thick over glacial till, glacial outwash, or bedrock. They are gently sloping to moderately steep and are mainly on fringe areas of old lake plains. These soils are medium to high in lime.

In a representative profile the surface layer is brown to dark-brown silt loam about 6 inches thick. It is underlain between depths of 6 and 16 inches by a leached subsurface layer of very friable silt loam that is dark yellowish brown and strongly acid to a depth of 11 inches, and yellowish brown and medium acid between depths of 11 and 16 inches. The subsoil occurs at a depth between 16 and 41 inches. It consists of mottled, dark grayish-brown, firm heavy silty clay loam to light silty clay that is slightly acid in the upper part and becomes neutral with increasing depth. Between depths of 34 and 41 inches, the lower part of the subsoil is mottled grayish-brown, firm, neutral silty clay loam that contains a few shale chips. At a depth of about 41 inches, a firm, calcareous glacial till layer of mottled, dark-brown gravelly silt loam begins, and extends to a depth of 52 or more inches.

In spring and during wet periods, Hudson soils have a seasonal high water table within 18 to 30 inches of the surface. The water table is perched on the slowly permeable subsoil. Permeability can range from slow to rapid in the loamy substratum. Maximum rooting depth is mainly 24 inches. Few roots extend below this depth. Available water capacity in the rooting zone is moderate to high. Available phosphorus and nitrogen are generally medium, and available potassium is high. Reaction in the surface layer is strongly acid to medium acid in unlimed areas. Aside from slope and the hazard of erosion, seasonal wetness and the difficulty of maintaining good tilth are the principal limitations to use of these soils for farming.

Representative profile of Hudson silt loam, loamy substratum, 2 to 8 percent slopes, in a meadow in town of Little Falls, 75 feet east of Burt Road, and 0.15 mile northeast of the intersection of Gun Club and Burt Roads:

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

A21—6 to 11 inches, dark yellowish-brown (10YR 4/4) light silt loam; weak, fine, subangular blocky structure; very friable; common fine roots; common, fine, medium, and coarse pores; 5 percent gravel; strongly acid; gradual, wavy boundary.

A22—11 to 16 inches, brown (10YR 5/3) silt loam; weak, medium and fine, subangular blocky structure; very friable; common fine roots; common, fine, medium, and coarse pores; medium acid; gradual, irregular boundary.

IIB21t—16 to 23 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam; few to common, medium, faint, yellowish-brown (10YR 5/4) mottles; moderate, coarse, subangular blocky structure; firm; few fine roots; common, medium and fine pores that have clay linings; grayish-brown (10YR 5/2) silt coats on ped surfaces in upper 3 inches, and continuous grayish-brown clay films on ped surfaces in lower 4 inches; slightly acid; gradual, smooth boundary.

IIB22t—23 to 34 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam to light silty clay; common, fine and medium, faint yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; many, fine, medium, and coarse pores that have clay linings; continuous grayish-brown clay films on ped surfaces; neutral; gradual, smooth boundary.

IIB23—34 to 41 inches, grayish-brown (10YR 5/2) silty clay loam; 30 percent medium, faint, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; firm; many, fine, medium, and coarse pores that have clay linings; patchy clay films on ped surfaces; few, scattered, black shale chips; neutral; gradual, smooth boundary.

IIIC—41 to 52 inches, dark-brown (10YR 3/3) gravelly silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; 30 percent black shale chips and gravel; calcareous; mildly alkaline.

The solum ranges from 24 to 45 inches in thickness. The depth to till, outwash material, or bedrock is generally within 40 to 60 inches of the surface. Reaction is strongly acid to mildly alkaline and pH increases with depth. The Ap or A1 horizons range from brown (10YR 5/3) to dark grayish-brown (10YR 4/2) in color. They are silt loam to silty clay loam. The A2 horizon ranges from pale brown (10YR 6/3) to brown (7.5YR 4/4) in color. In some profiles faint mottling is in the lower part of the A horizon. The A horizon interfingers into the IIB2t horizon and forms an irregular boundary. The IIBt horizon ranges from dark grayish-brown (2.5Y 4/2) to brown (7.5YR 4/4) in color, and is heavy silty clay loam to clay. Where present, the IIC horizon is similar to the IIB horizon in color and texture. The IIIC horizon is coarser in texture than the overlying horizons, and is gravelly in most areas.

Hudson soils formed in similar material and make up a drainage sequence with the somewhat poorly drained Rhinebeck soils. They are also near Ilion, Williamson, Hartland, and Agawam soils. Hudson soils have finer textured Bt horizons that are lacking in silty Williamson soils and Hartland and Agawam soils. Also, they lack the fragipan of Williamson soils.

Hudson silt loam, loamy substratum, 2 to 8 percent slopes (HyB).—This gently sloping soil is on fringe areas of old lake plains where glacial till, glacial outwash, or bedrock is at a depth of 40 to 60 inches. Individual areas are irregular in shape, and range from 3 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of wetter Rhinebeck and Ilion soils in lower areas and depressions, spots of silty Williamson soils, and small areas that are less than 40 inches deep to the loamy substratum or bedrock.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate in cultivated areas that are unprotected. Slight wetness in places delays planting briefly. This soil clods and puddles easily if worked at the wrong moisture content. Capability unit IIe-5; woodland suitability group 2o1.

Hudson silt loam, loamy substratum, 8 to 15 percent slopes (HyC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that in places the subsurface layer is thinner. It is on fringe areas of old glacial lake plains where glacial till, glacial outwash, or bedrock are within depths of 40 to 60 inches. Individual areas are irregularly shaped, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of wetter Rhinebeck and Ilion soils in depressions and along drainageways, spots of coarser textured Hartland and Agawam soils, small areas where the loamy substratum is less than 40 inches below the surface, and eroded areas of soils that have a silty clay loam surface layer.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is severe in cultivated areas that are unprotected. Slight wetness in places delays planting briefly in the spring. This soil clods and puddles easily if worked at the wrong moisture content. Capability unit IIIe–5; woodland suitability group 2r3.

Hudson silt loam, loamy substratum, 15 to 30 percent slopes (HyD).—This moderately steep soil has a profile similar to the one described as representative for the series except that the subsurface layer is thinner in places. It is on fringe areas of old glacial lake plains where glacial till, glacial outwash, or bedrock are within depths of 40 to 60 inches. Individual areas are irregularly shaped or long and narrow, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of wetter Rhinebeck and Ilion soils in depressions and along drainageways, a few spots of coarser textured Hartland and Agawam soils, and small areas where the depth to the loamy substratum is less than 40 inches or greater than 60 inches. In places, past erosion has exposed a silty clay loam surface layer that was once a part of subsoil.

This soil is poorly suited to farming because of slope and the severe hazard of erosion. Tillage operations should be largely confined to renovation for hay or pasture. The soil is also well suited to trees. Capability unit IVe–4; woodland suitability group 2r4.

Ilion Series

The Ilion series consists of deep, poorly drained, medium-textured soils that have a moderately fine textured subsoil. These soils formed in loamy glacial till derived mainly from dark-colored clay shale or reworked clayey lacustrine sediment. They are level, or are in depressions on upland glacial till plains where runoff is slow or water accumulates. These soils are high in lime.

In a representative profile the surface layer is black silt loam about 9 inches thick. The subsoil, between depths of 9 and 29 inches, is mottled, dark-gray and gray, firm silty clay loam that contains a few gravel and shale chips and is neutral. Between depths of 29 and 36 inches, the subsoil is mottled, gray, firm, mildly alkaline shaly silt loam. At a depth of 36 inches, it merges with a calcareous substratum of mottled, dark grayish-brown, firm gravelly silt loam that extends to a depth of 50 or more inches.

The water table is at or near the surface of Ilion soils during much of the year. It is perched on the slowly permeable substratum. Maximum rooting depth is mainly 10 inches, depending on the water table. A few roots penetrate to greater depths. Available water capacity of this zone is low, but there is usually more than enough moisture for plant growth. Available nitrogen is high, but it is released slowly because of excessive wetness. Available potassium is high, and available phosphorus is medium. Reaction in the surface layer ranges from medium acid to neutral in unlimed areas. Excessive water is the principal limitation to the use of these soils for farming. Many areas are good pond sites (fig. 10).

Representative profile of Ilion silt loam in a meadow in town of Norway, 168 feet east of Elm Tree Road, 0.18 mile south of the intersection of Elm Tree and Hard Scrabble Roads:

A1—0 to 9 inches, black (10YR 2/1), dark-gray (10YR 4/1) dry, silt loam; common, medium, distinct, dark reddish-brown (5YR 3/4) mottles; weak, medium and coarse, granular structure; very friable; many medium and fine roots; few medium pores; few washed sand grains; slightly acid; gradual, smooth boundary.

B21tg—9 to 18 inches, dark-gray (10YR 4/1), gray (10YR 5/1) crushed, light silty clay loam; many, medium, prominent, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few coarse and medium roots; common medium and fine pores; patchy clay films on ped faces and in pores, few black shale chips; few, small, reddish iron concretions; 10 percent gravel and shale chips; neutral; gradual, wavy boundary.

B22tg—18 to 29 inches, gray (10YR 5/1) silty clay loam; common, medium, prominent, yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; few medium pores; patchy clay films on ped surfaces and in pores; 5 percent black shale chips; neutral; gradual, wavy boundary.

B3g—29 to 36 inches, gray (10YR 5/1) shaly heavy silt loam; common, medium, prominent, yellowish-brown (10YR 5/6) mottles; massive; firm; 15 percent black shale chips; mildly alkaline; gradual, wavy boundary.

Cg—36 to 50 inches, dark grayish-brown (2.5Y 4/2) gravelly silt loam; common, fine, faint, olive (5Y 4/3) mottles; massive; firm; few remnants of sandstone; 15 percent gravel; calcareous; moderately alkaline.

The solum ranges from 24 to 40 inches in thickness. Depth to free carbonates ranges from 20 to 60 inches. Depth to bedrock ranges from 40 inches to more than 96 inches. Coarse fragments range from 5 to 20 percent throughout the profile, and include stone-sized fragments.

The Ap or A1 horizon has hues of 10YR or 2.5Y, and values of 2 or 3 when moist and 4 or 5 when dry; chroma is 1 to 2. Structure ranges from granular to weak, subangular blocky. Reaction is medium acid to neutral.

The A2 horizon, if present, has hues ranging from 5Y to 10YR and values of 4 or 5; chroma is 1 or 2. This horizon has distinct to prominent mottles. It is light silty clay loam to loam in texture and is weak, platy or subangular blocky in structure. Reaction is medium acid to neutral. The horizon ranges from 0 to 5 inches in thickness.

The B2tg horizons have hues ranging from 5Y to 10YR, and values of 4 to 6; chroma is 1 or 2. Common to many, distinct to prominent, high-chroma mottles are present in these horizons. The horizons are clay loam to silty clay loam. They range from moderate blocky to prismatic in structure, and have clay films on the ped surfaces and in the pores. Reaction is medium acid to mildly alkaline.

The C horizon has hues ranging from 5Y to 10YR, and values of 3 or 4; chrome is 1 or 2. It is silt loam to clay loam, and is usually calcareous. Reaction is neutral to moderately alkaline.

Ilion soils formed in similar material and make up a drainage sequence with the well drained to moderately well drained Mohawk and the somewhat poorly drained Manheim soils. They are also near Burdett, Rhinebeck, Lamson, Lyons, and Cohoctah soils. Ilion soils have poorer drainage than the Burdett and Rhinebeck soils. They have Bt horizons that are

Figure 10.—**Trout pond on an Ilion soil. The pond was constructed in an idle wetland area.**

not present in the Lyons, Lamson, and Cohoctah soils. Ilion soils are similar to very poorly to poorly drained Sun soils, but have Bt horizons that are lacking in Sun soils, and contain less sand in the solum.

Ilion silt loam (In).—This level to nearly level soil is on nearly level or depressional areas of the glacial till plain where runoff is slow or water accumulates. Slope is mainly less than 3 percent. Individual areas are irregularly shaped, and range from 3 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of better drained Manheim, Burdett, and Rhinebeck soils on knolls, spots of coarser textured Lamson and similar Lyons soils on similar landscapes, small areas along drainageways of Cohoctah soils that flood, and small areas of soils that have a mucky surface layer.

Unless drained, this soil is not suited to farming. It provides pasture, and is suited to tree species that tolerate wetness. With drainage, this soil is suited to most crops grown in the county. Drainage outlets are difficult to locate in places. Capability unit IVw-1; woodland suitability group 4w1.

Ilion and Sun very stony silt loams (Is).—The soils in this group are level or nearly level. Slope is mainly less than 3 percent. Some areas are made up of only Ilion soils, others of only Sun soils, and still others may contain both soils. Both of these soils have profiles similar to those described as representative for their respective series, except that large stones are about 5 to 30 feet apart on the surface and cover about 1.5 to 50 cubic yards per acre-foot. These soils are on level and depressional areas of the till plain where runoff is slow or water accumulates. Individual areas are irregular in shape, and range from 3 to 20 acres.

Included with these soils in mapping were small areas of drier Manheim, Burdett, and Massena soils on slight rises, a few small areas along drainageways of Cohoctah soils that flood, and a few spots that are shallow and moderately shallow over limestone bedrock.

Stoniness and wetness prohibit the use of these soils for crops. The soils provide some wild pasture, and are suited to tree species that tolerate wetness. Capability unit VIIs-4; woodland suitability group 4w1.

Lairdsville Series, Loamy Subsoil Variant

The loamy subsoil variant of the Lairdsville series consists of moderately deep, well drained to moderately well drained, medium-textured soils that formed in thin deposits of glacial till derived mainly from the underlying red shale bedrock, or partly in residuum from this shale. Depth to bedrock is 20 to 40 inches. These soils are gently sloping to moderately steep and are on bedrock-controlled landscapes of upland till plains. They are low to high in lime.

In a representative profile the surface layer is dark reddish-brown silt loam about 9 inches thick. Below this is a subsurface layer of reddish-brown shaly silt loam about 3 inches thick that is friable and strongly acid. The subsoil begins at a depth of about 12 inches and extends to a depth of 28 inches. It consists of friable shaly silt loam that is medium acid and dusky red to a depth of 20 inches, and mottled dark reddish brown below. At a depth of 28 inches, the subsoil rests on fractured red shale bedrock.

In spring and during wet periods, the loamy subsoil variant of Lairdsville soils has a seasonal high water table within 18 to 30 inches of the surface. This water table is perched on the moderately slowly or slowly permeable subsoil. Maximum rooting depth is controlled by the depth to bedrock, and is mainly 20 to 30 inches. Available water capacity in the rooting zone is moderate. Available phosphorus, potassium, and nitrogen are generally medium. Reaction in the surface layer is strongly acid to neutral in unlimed areas. Aside from slope and the hazard of erosion, depth to bedrock and slight wetness in places are the principal limitations to the use of these soils for farming.

Representative profile of Lairdsville silt loam, loamy subsoil variant, 3 to 8 percent slopes, in a pasture in town of German Flatts, 500 feet west of Casey Road, and 0.2 mile north of the intersection of Casey and Robinson Roads:

Ap—0 to 9 inches, dark reddish-brown (2.5YR 3/4), weak-red (10YR 5/3) dry, silt loam; weak, coarse, granular structure; friable; many fine roots; few medium pores; 15 percent fine, red shale chips; strongly acid; abrupt, smooth boundary.

A&B—9 to 12 inches, reddish-brown (2.5YR 4/4) shaly silt loam; weak, medium and coarse, subangular blocky structure; friable; common fine roots; common medium pores; horizon is the A2 interfingering into B21t; 20 percent fine, red shale chips; strongly acid; gradual, wavy boundary.

B21t—12 to 20 inches, dusky red (10R 3/3) shaly silt loam; weak, coarse, subangular blocky structure; friable; common fine roots; common fine pores; thin patchy clay films on ped faces and in pores; 30 percent fine and coarse, red shale fragments; medium acid; gradual, wavy boundary.

B22t—20 to 28 inches, dark reddish-brown (2.5YR 3/4) shaly silt loam; common, medium, distinct, reddish-brown (5YR 5/3) mottles; weak, coarse, subangular blocky structure; friable; few fine pores; patchy clay films on shale chips and in pores; few, weathered, soft, fine, light olive-brown (2.5Y 5/6) shale chips scattered throughout horizon; 35 percent fine, red shale chips; medium acid.

R—28 inches +, red fractured shale, medium acid.

The depth to bedrock ranges from 20 to 40 inches, and commonly corresponds to the thickness of the solum. Coarse fragments, dominantly shale but including varying amounts of sandstone, range from very few to 35 percent, and commonly increase with depth. Hue ranges from 10R to 10YR and 7.5YR, in the Ap and upper B horizons. The solum is silt loam, loam, and clay loam, and has a silty clay loam B horizon in some profiles. Reaction is strongly acid to neutral in the upper horizons, and is medium acid to mildly alkaline in the lower part of the solum and the shale bedrock. The Ap horizon has color values of 3 to 5; chroma is 3 or 4. The B2t horizon has color values of 3 to 5; chroma is 3 or 4. Thin clay films are present on ped surfaces and, in some profiles, on the shale chips in the B2t horizon.

The loamy subsoil variant of Lairdsville soils formed in similar material and makes up a drainage sequence with the loamy subsoil variant of Lockport soils, which are somewhat poorly drained. These soils are also near deeper Ontario and Hilton soils in places.

Lairdsville silt loam, loamy subsoil variant, 3 to 8 percent slopes (LaB).—This gently sloping soil is on landscapes of upland till plains that are affected by the underlying bedrock. Individual areas are irregularly shaped and range from 5 to 25 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of the similar, but wetter, loamy subsoil variant of Lockport soils on lower areas or in depressions. Also included were spots of deeper Hilton soils. Included in a few places were small areas of soils that have a silty clay subsoil, and small areas of a similar soil that formed in greenish-gray shale and has olive rather than reddish hues.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Slight wetness in places delays planting briefly in spring. Capability unit IIe–5; woodland suitability group 3o1.

Lairdsville silt loam, loamy subsoil variant, 8 to 15 percent slopes (LaC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that the subsurface layer is thinner in places. It is on landscapes in upland till plains that are influenced by underlying bedrock. Individual areas are irregularly shaped, and range from 5 to 25 acres.

Included with this soil in mapping were small areas of the similar, but wetter, loamy subsoil variant of Lockport soils in lower areas and along drainageways. Also included were spots of deeper Ontario and Hilton soils, small areas of a similar soil that formed in greenish-gray shale and has olive rather than reddish hues, and a few areas that have a silty clay subsoil.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is severe in cultivated areas that are unprotected. In places, slight wetness delays planting briefly. Capability unit IIIe–5; woodland suitability group 3r1.

Lairdsville silt loam, loamy subsoil variant, 15 to 25 percent slopes (LaD).—This moderately steep soil has a profile similar to the one described as representative for the series except that the subsurface layer is thinner or not present in places. Also, the depth to bedrock is more erratic from place to place. This soil is on upland till landscapes that are influenced by underlying bedrock. Individual areas are long and narrow, and range from 3 to 25 acres.

Included with this soil in mapping were small areas of the similar, but wetter, loamy subsoil variant of Lockport soils along foot slopes and drainageways. Also included were spots of deeper Ontario soils, small areas of a similar soil that formed in greenish-gray shale and has olive rather than reddish hues, areas that are shallower to bedrock, and areas where much or all of the original surface layer has been lost as a result of erosion.

This soil is poorly suited to farming because of the moderately steep slopes and the severe hazard of erosion. The use of machinery is extremely difficult and hazardous. Tillage operations should be largely confined to renovation for hay or pasture. This soil is fairly well suited to trees. Capability unit IVe–4; woodland suitability group 3r2.

Lamson Series

The Lamson series consists of deep, poorly drained and very poorly drained, medium-textured soils that have a medium-textured to moderately coarse textured subsoil. These soils formed in lacustrine deposits dominated by sand and very fine sand. They are level or nearly level and are on lake plains. Lamson soils are high in lime.

In a representative profile the surface layer is black mucky silt loam about 9 inches thick. The subsurface layer is mottled, grayish-brown, neutral, friable very fine sandy loam about 5 inches thick. Between depths of 14 and 21 inches the upper part of the subsoil is mottled, gray, neutral fine sandy loam that is friable and contains some gravel. Between depths of 21 inches and 34 inches, the subsoil is yellowish-brown and gray, neutral, very friable very fine sandy loam. At a depth of 34 inches it is underlain by a calcareous substratum of mottled, dark-gray fine sandy loam that is very friable and extends to a depth of 50 or more inches.

Lamson soils have a prolonged high water table that is at or near the surface much of the year. Permeability is moderate. Maximum rooting depth is determined by the water table and, unless the soil is drained, it is mainly 10 to 15 inches. Available water capacity in the rooting zone is low to moderate, but normally more than enough moisture is available for plant growth. Available phosphorus and potassium are medium to low. Available nitrogen is high, but it is released slowly when the soils are wet and cold. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Excess water is the principal limitation to use of these soils for farming.

Representative profile of Lamson mucky silt loam in a pasture in town of Salisbury, 240 feet east of Military Road, 0.35 mile northwest of the intersection of Military and Thompson Roads:

A1—0 to 9 inches, black (10YR 2/1) crushed and uncrushed, mucky silt loam; weak, medium and fine, granular structure; very friable; many medium and fine roots; common medium pores; few washed sand grains; 2 percent gravel; neutral; abrupt, smooth boundary.

A2g—9 to 14 inches, grayish-brown (2.5Y 5/2), (10YR 5/2) crushed, very fine sandy loam; common, coarse, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; friable; few coarse roots; common medium pores; 2 percent gravel; neutral; gradual, smooth boundary.

IIB21g—14 to 21 inches, fine sandy loam that has gray (10YR 5/1) ped faces, dark grayish-brown (10YR 4/2) ped interiors; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; friable; few coarse roots; few medium pores; 14 percent gravel; neutral; gradual, smooth boundary.

IIIB22g—21 to 34 inches, 50 percent yellowish-brown (10YR 5/6), 50 percent dark gray (10YR 4/1), very fine sandy loam; massive; very friable; few coarse roots; no coarse fragments; neutral; gradual, smooth boundary.

IIICg—34 to 50 inches, dark-gray (10YR 4/1) fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; very friable; no coarse fragments; calcareous.

The solum ranges from 30 to 40 inches in thickness. The depth to free lime ranges from 18 to 60 inches. The profile ranges from fine sandy loam and very fine sandy loam to thin layers of sandy clay loam. Individual horizons have few to no coarse fragments in places. In most areas the A horizon is mucky. Hue ranges from 2.5Y to 7.5YR. This horizon has color values of 2 or 3; chroma is 1 or 2. In the B and C horizons, hue ranges from 7.5YR to 2.5Y. Chroma is 1 or 2 in the upper part of the profile, but is 3 to 6 in some horizons above a depth of 30 inches. Horizons below the A1 horizon have color values of 4 to 6. In many areas the C horizon consists of layers of fine sand, very fine sand, and silt.

Lamson soils are near Raynham, Ilion, Lyons, and Sun soils. They contain less silt and are usually wetter than the poorly to somewhat poorly drained Raynham soils. Lamson soils formed in lacustrine sediment, in contrast to the till deposits in which the Ilion, Lyons, and Sun soils formed. They have coarser textured B horizons than Ilion and Lyons soils.

Lamson mucky silt loam (Lk).—This level or nearly level soil has a slope of less than 3 percent. It is on flat or depressed areas of lake plains where runoff is slow or water accumulates. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of slightly better drained Raynham soils. Also, along lake plains and till plain fringes, spots of Ilion, Lyons, and Sun soils, all of which formed in till, were included. Other inclusions were areas that lack the mucky silt loam surface layer.

Unless drained, this soil is not suitable for farming. It provides some pasture, and is suited to tree species that tolerate wetness. With adequate drainage it is suited to most crops grown in the county. Drainage outlets are often difficult to locate. Capability unit IVw-1; woodland suitability group 4w1.

Lansing Series

The Lansing series consists of deep, well-drained, medium-textured soils that formed in calcareous glacial till derived mainly from shale, limestone, sandstone, and siltstone. These soils are nearly level to steep and are on upland till plains. They are medium in lime.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. It is underlain by a leached subsurface layer of dark yellowish-brown, medium acid, very friable gravelly silt loam that extends to a depth of about 16 inches. Between depths of 16 and 31 inches, the upper part of the subsoil is brown to dark-brown, medium acid, friable gravelly silt loam. The lower part of the subsoil is mottled, brown to dark-brown gravelly very fine sandy loam about 11 inches thick that is friable and medium acid. The dense till substratum begins at a depth of about 42 inches. It consists of firm, mottled, brown to dark-brown gravelly silt loam to a depth of 50 or more inches that is neutral to a depth of about 47 inches and calcareous below.

The water table in Lansing soils is normally at a depth of more than 30 inches, but in places it is perched on the slowly or very slowly permeable substratum and begins within 24 to 30 inches of the surface in spring and during wet periods. Maximum rooting depth is mainly 30 inches. Few roots extend below this depth. Available water capacity is high. Available phosphorus and nitrogen are generally medium, and available potassium is high. Reaction in the surface layer is medium acid to neutral in unlimed areas. Aside from the slope and the hazard of erosion, there are few limitations to use of these soils for farming where they have been cleared of surface stones. Some areas are extremely stony and are not suited to crops, and are poorly suited to pasture.

Representative profile of Lansing silt loam, 8 to 15 percent slopes, in a pasture in town of German Flatts, 45 feet west of Vrooman Road, 0.35 mile north of the intersection of New York State Highway 168 and Vrooman Road:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2), pale-brown (10YR 6/3) dry, silt loam; weak, medium and fine, granular structure; friable; many coarse and medium roots; few fine pores; few washed sand grains; 5 percent gravel; medium acid; gradual, smooth boundary.

A2—9 to 16 inches, dark yellowish-brown (10YR 4/4) gravelly silt loam; weak, medium, subangular blocky structure; very friable; many coarse roots; common medium pores; few, scattered, washed sand grains; 20 percent gravel; medium acid; gradual, irregular boundary.

B2t—16 to 31 inches, brown to dark-brown (10YR 4/3) gravelly silt loam; weak, coarse, subangular blocky structure; friable; few coarse roots; common medium pores; dark grayish-brown (10YR 4/2) silty material surrounding peds in the upper 2 inches, below this thin, patchy clay films on ped surfaces and in pores; 15 percent gravel, cobblestones, and shale fragments; medium acid; gradual, wavy boundary.

B3—31 to 42 inches, brown to dark-brown (10YR 4/3) gravelly very fine sandy loam; few, fine, faint, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few roots in upper part; common medium and coarse pores; 20 percent gravel, cobblestones, and shale fragments; medium acid; gradual, wavy boundary.

C—42 to 50 inches, brown to dark-brown (10YR 4/3) gravelly silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) and common, fine, faint, gray to light-gray (10YR 6/1) mottles; massive; firm; 20 percent gravel, cobblestones, and shale fragments; neutral in the upper part, becoming calcareous and moderately alkaline below a depth of 47 inches.

The solum ranges from 32 to 48 inches in thickness. Gravel, cobblestones, shale, and stone fragments range from 2 to 50 percent, and increase with depth. The content of coarse fragments is less than 35 percent.

The A1 or Ap horizons range from grayish brown (10YR 5/2) to very dark grayish brown (10YR 3/2) in color. They are very fine sandy loam to silt loam, and are neutral to medium acid.

The A2 horizon ranges from dark yellowish brown (10YR 4/4 to light yellowish brown (10YR 6/4) in color. It is weak, subangular blocky in structure, and is very fine loam to silt loam in texture. Reaction is medium acid to neutral. The A2 horizon interfingers into the B2t horizon, and in many profiles forms A&B and B&A horizons.

The B2t horizon ranges from brown (10YR 5/3) to olive (5Y 4/4) in color. The texture is heavy loam to silt loam. This horizon ranges from angular to subangular blocky in structure. Reaction is medium acid to neutral. Clay films are on the ped surfaces and in the pores in the B2t horizon.

The B3 horizon has about the same characteristics as the B2t horizon, but lacks clay films on ped faces and is weaker in structure. Reaction is slightly acid to neutral, and the consistence is friable to firm.

The C horizon is firm basal till containing variable proportions of shale, limestone, and fine-grained sandstone. It is neutral in the upper part in places, but becomes calcareous and moderately alkaline with depth. Colors and textures are similar to those of the B horizons.

Lansing soils are closely associated with moderately well drained Conesus soils that formed in similar material. They are also near Mohawk, Manheim, Honeoye, Bombay, Broadalbin, and Manlius soils. Lansing soils lack the dark-colored shale content and are lighter in color than Mohawk and Manheim soils. They are also better drained than Manheim soils. Lansing soils have a thinner solum than Honeoye soils, have finer textured Bt horizons than Bombay soils, and lack the fragipan of Broadalbin soils. They are deeper, and have a Bt horizon that is lacking in the more acid Manlius soils.

Lansing silt loam, 8 to 15 percent slopes (LnC).—This moderately sloping soil is on hillsides on upland till landscapes. Individual areas are elongated or irregularly shaped, and range from 5 to 50 acres. This soil has the profile described as representative for the series.

525-444—75——10

Included with this soil in mapping were small areas of moderately well drained Conesus soils on lower areas. In the towns of German Flatts and Stark, a few spots of less acid Honeoye soils were included. Also included were a few small areas of Mohawk and moderately deep Manlius soils. Other inclusions, mainly in the towns of Schuyler and Frankfort, were spots of soils that have a weak fragipan.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Capability unit IIIe-1; woodland suitability group 2o1.

Lansing silt loam, 15 to 25 percent slopes (LnD).—This moderately steep soil has a profile similar to the one described as representative for the series except that in places the subsurface layer is thinner. It is on side slopes of upland glacial till landscapes. Individual areas are elongated, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of moderately well drained Conesus soils, mainly along foot slopes. In the towns of German Flatts and Stark, spots of less acid Honeoye were included. Also included were a few small areas of Mohawk and moderately deep Manlius soils. Other inclusions, mainly in the towns of Schuyler and Frankfort, were spots of soils that have a weak fragipan.

This soil is poorly suited to farming, because of slope and the severe hazard of erosion. The use of machinery is extremely difficult and hazardous. Tillage operations should be confined mainly to renovation for hay or pasture. This soil is well suited to high-yield varieties of alfalfa. It is also well suited to trees. Capability unit IVe-1; woodland suitability group 2r1.

Lima Series

The Lima series consists of deep, moderately well drained, medium-textured soils that formed in strongly calcareous, loamy glacial till derived mainly from limestone, sandstone, and shale. They are nearly level to moderately sloping and are on upland till landscapes where runoff is moderate or some water accumulates. These soils are high in lime.

In a representative profile the surface layer is dark-brown silt loam that contains a few gravel and shale fragments and is about 9 inches thick. It is underlain by a layer of brown to dark-brown, neutral, very friable light silt loam that is about 6 inches thick and contains a few gravel and shale fragments. The subsoil, at depths between 15 and 31 inches, is mottled, dark-brown, friable gravelly silt loam that is neutral to a depth of 25 inches and calcareous below. At a depth of 31 inches the subsoil merges with a dense, calcareous till substratum of mottled, dark-brown, firm very gravelly silt loam that extends to a depth of 50 or more inches.

In spring and during wet periods, Lima soils have a seasonal high water table within 18 to 24 inches of the surface. The water table is perched on the slowly permeable substratum. Maximum rooting depth is mainly 24 inches. Few roots penetrate below this depth. Available water capacity in the rooting zone is moderate. Available phosphorus and nitrogen are generally medium, and available potassium is high. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Aside from slope and the hazard of erosion, slight wetness is the principal limitation to use of these soils for farming.

Representative profile of Lima silt loam, 3 to 8 percent slopes, in a hayfield in town of Warren, 60 feet east of Town Road, and 0.25 mile south of Crains Corners:

Ap—0 to 9 inches, dark-brown (10YR 3/3), brown (10YR 5/3) dry, silt loam; weak, medium, subangular blocky structure and weak, medium, granular; very friable; many medium and fine roots; common medium pores; 10 percent gravel and shale fragments; neutral; abrupt, smooth boundary.

B&A—9 to 15 inches, brown to dark-brown (10YR 4/3) light silt loam; weak, coarse, subangular blocky structure; very friable; common fine roots; common medium pores; 10 percent gravel and shale fragments; pale-brown (10YR 6/3) silt coatings on vertical ped surfaces; neutral; gradual, wavy boundary.

B2t—15 to 25 inches, dark-brown (10YR 3/3) gravelly silt loam; few, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; friable; few fine roots; many medium and coarse pores; patchy clay films on ped faces and in pores; 30 percent gravel and shale fragments; neutral; gradual, wavy boundary.

B3—25 to 31 inches, dark-brown (10YR 3/3) gravelly silt loam; few, fine, faint, gray to light-gray (10YR 6/1) and few, medium, distinct, yellowish-red (5YR 5/6) mottles; moderate, coarse, subangular blocky structure; friable; common medium pores; thin, patchy clay films on ped faces and in pores; 30 percent gravel and shale fragments; calcareous, mildly alkaline; gradual, wavy boundary.

C—31 to 50 inches, dark-brown (10YR 3/3) very gravelly silt loam; few, fine, faint, yellowish-brown (10YR 5/6) mottles; massive; firm; 40 percent gravel and shale fragments; calcareous; moderately alkaline.

The solum ranges from 18 to 32 inches in thickness. Coarse fragments increase with depth in the soil, ranging from 5 to 30 percent in the solum, and from 30 to 70 percent in the C horizon. Hue ranges from 7.5YR to 2.5Y.

The Ap horizon has color values of 3 to 5; chroma is 2 or 3. It is granular or subangular blocky in structure. Reaction is slightly acid to neutral.

The B&A horizon has color values of 4 or 5; chroma is 3 or 4. Structure and reaction are similar to the Ap horizon. This horizon is very fine sandy loam to silt loam.

The B2t horizon is sandy clay loam to silt loam. It is moderate, angular to subangular blocky in structure, and has clay films on the ped surfaces and in pores. Reaction is neutral. It has color values of 3 or 4; chroma is 3 or 4. High-chroma mottles are in the B&A and B2t horizons in places, and high- or low-chroma mottles in the B3 and C horizons. The B3 horizon is similar to the B2t, but has less clay films on ped surfaces and is calcareous.

The C horizon has value and chroma similar to the B horizons. It is calcareous, firm or very firm, and is stony to gravelly fine sandy loam, loam, or silt loam.

Most Lima soils in Herkimer County have darker color values in the B and C horizons than is defined as the range for the series, but this difference does not alter their usefulness and behavior.

Lima soils make up a drainage sequence with the well-drained Honeoye, the somewhat poorly drained Appleton, and the poorly and very poorly drained Lyons soils, all of which formed in similar material. They are also similar to and near Hilton, Conesus, and Mohawk soils. They have a thinner solum than Hilton and Conesus soils, and lack the dark-colored, calcareous shale content of Mohawk soils.

Lima silt loam, 0 to 3 percent slopes (LoA).—This level or nearly level soil has a profile similar to the one described as representative for the series except that in places a few faint mottles are in the lower part of the subsurface layer. It is on ridgetops of drumlins and on foot-slope areas on glacial till uplands where runoff is moderate or some water accumulates. Individual areas are long and narrow, and range from 5 to 35 acres.

Included with this soil in mapping were small areas of better drained Honeoye soils on knolls and wetter Appleton and Lyons soils in low spots and depressions, some spots of Hilton soils in the town of Litchfield, and small areas of Conesus and Mohawk soils, mainly in the towns of Columbia, Warren, and Stark.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Slight wetness generally delays planting briefly. This soil responds well to applications of fertilizer according to soil tests. Random drainage of wetter soil inclusions is often desirable to provide more uniform field conditions for tillage operations. Capability unit IIw–1; woodland suitability group 2o1.

Lima silt loam, 3 to 8 percent slopes (LoB).—This gently sloping soil is on side slopes of drumlins, on upland till landscapes where some runoff water accumulates. Individual areas are long and narrow, and range from 5 to 35 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of better drained Honeoye soils on higher areas, wetter Appleton and Lyons soils in lower areas and depressions and around seeps, a few spots of Hilton soils in the town of Litchfield, and small areas of Conesus and Mohawk soils, mainly in the towns of Columbia, Warren, and Stark.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Also, slight wetness in places delays planting briefly in spring. This soil responds well to applications of fertilizer according to soil tests. Capability unit IIe–4; woodland suitability group 2o1.

Lima silt loam, 8 to 15 percent slopes (LoC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that in places the subsurface layer is thinner. It is on foot-slope areas of drumlins, on upland till landscapes where some runoff water accumulates. Individuals areas are long and narrow, and range from 5 to 35 acres.

Included with this soil in mapping were small areas of drier Honeoye soils on higher areas, wetter Appleton and Lyons soils around seeps and in low areas and along drainageways, a few small areas of Hilton soils in the town of Litchfield, and spots of Conesus and Mohawk soils, mainly in the towns of Columbia, Warren, and Stark. Also included were a few eroded spots.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Slight wetness in places delays planting briefly in spring. This soil responds well to applications of fertilizer according to soil tests. Capability unit IIIe–4; woodland suitability group 2o1.

Lockport Series, Loamy Subsoil Variant

The loamy subsoil variant of the Lockport series consists of moderately deep, somewhat poorly drained, medium-textured soils that have a medium-textured to moderately fine textured subsoil. These soils formed in thin glacial till deposits derived mainly from underlying shale bedrock at depths between 20 and 40 inches. They are level to very gently sloping and are on upland till landscapes that are influenced by the bedrock. Runoff is slow or water accumulates. These soils are low to high in lime.

In a representative profile the surface layer is dark reddish-brown silt loam about 10 inches thick that is distinctly mottled in the lower 5 inches. It is underlain by a layer of mottled reddish-brown, firm silty clay loam about 3 inches thick. Between depths of 13 and 18 inches, the upper part of the subsoil is mottled, reddish-brown, neutral, firm silty clay loam. Between depths of 18 and 23 inches, the subsoil is weak-red, neutral, friable shaly silt loam. It merges at a depth of 23 inches with a substratum of neutral fractured shale that is interspersed with silty material and is weak red in color. This rests on unfractured, weak-red shale bedrock at a depth of 28 inches.

In spring and during wet periods, Lockport soils have a seasonal high water table within 6 to 18 inches of the surface. The water is perched above slowly permeable subsoil layers and bedrock. Maximum rooting depth is mainly 10 to 15 inches. Few roots extend below these depths. Available water capacity in the rooting zone is low to moderate. Available phosphorus is medium, and available potassium is medium to high. Available nitrogen is high, but it is released slowly in spring when the soils are cold and wet. Reaction in the surface layer is medium acid to neutral in unlimed areas. Excess water is one of the principal limitations to use of these soils for farming. Artificial drainage measures are difficult to install because of the moderate depth to bedrock.

Representative profile of Lockport silt loam, loamy subsoil variant, 0 to 4 percent slopes, in a pasture in town of German Flatts, 75 feet west of New York State Highway 28 and 0.45 mile north of Dennison Corners:

A11—0 to 5 inches, dark reddish-brown (5YR 3/2), reddish-gray (5YR 5/2) dry, silt loam; weak, coarse and medium, granular structure; friable; many medium and fine roots; common medium and fine pores; neutral; gradual, smooth boundary.

A12—5 to 10 inches, dark reddish-brown (5YR 3/2), gray to light-gray (5YR 6/1) dry, heavy silt loam; common, medium, distinct, yellowish-red (5YR 4/6) mottles; moderate, coarse, granular structure and weak, medium, subangular blocky; friable; common fine roots; common medium pores; neutral; gradual, wavy boundary.

B&A—10 to 13 inches, reddish-brown (5YR 4/3) silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few fine roots; common medium pores that have patchy clay linings; few olive-yellow (2.5Y 6/6) shale chips; dark reddish-gray silt coatings on vertical ped surfaces; neutral; gradual, wavy boundary.

B21t—13 to 18 inches, reddish-brown (2.5YR 4/4), silty clay loam; common, medium, distinct, yellowish-brown mottles; moderate, coarse, angular blocky structure; firm; few fine roots; few fine pores; patchy clay films on ped surfaces and in pores; few, weathered, olive-yellow (2.5Y 6/6) shale chips; neutral; gradual, wavy boundary.

B22t—18 to 23 inches, weak-red (2.5YR 4/2) shaly silt loam; friable; moderate, coarse, subangular blocky structure; few fine roots; common medium and fine pores; patchy clay films on ped surfaces and in pores; 25 percent shale fragments; neutral; gradual, wavy boundary.

C—23 to 28 inches, weak-red (2.5YR 4/2) fractured shale that has silty material in interstices; 85 percent shale fragments; neutral; gradual, wavy boundary.

R—28 inches +, weak-red (2.5YR 4/2) shale bedrock; neutral; difficult to penetrate with a spade.

Depth to bedrock ranges from 20 to 40 inches, and commonly corresponds to the thickness of the solum. Coarse fragments, dominantly shale but including sandstone and limestone, range from very few to about 35 percent, and are most abundant near bedrock. Glacial gravel is present in small amounts in places.

The A1 horizon and, where plowed, the Ap horizon range from 10YR to 5YR in hue. Color values are 3 to 5; chroma is 2 or 3. Reaction is medium acid to neutral. These horizons range from granular to subangular blocky in structure.

The B&A horizon has hues ranging from 10YR to 5YR, and values of 4 to 6; chroma is 1 to 4. Distinct, high-chroma mottles are present. The horizon is moderate, angular to subangular blocky to platy in structure, and is very fine sandy loam to silty clay loam in texture. Reaction is medium acid to neutral.

The B2t horizon has ped interiors that have hues ranging from 10YR to 5YR, and values of 4 or 5; chroma is 2 to 4. Chroma of ped surfaces is 2 or less. High-chroma mottles are distinct or prominent. The B2t horizon ranges from strong to moderate, prismatic, subangular to angular blocky in structure, and has patchy clay films on ped surfaces. The texture is silt loam to silty clay loam, and reaction is medium acid to neutral.

The C horizon, if present, has about the same hue, value, and chroma as the B horizon, and is shaly silt loam to fractured shale that has silty material in the interstices. Reaction is medium acid to moderately alkaline. Some penetration can be made into the shale bedrock with a spade when the soil is moist.

The loamy subsoil variant of Lockport soils formed in similar material and makes up a drainage sequence with the moderately well drained to well drained loamy subsoil variant of Lairdsville soils. Areas of this soil are also near similar but deeper Appleton soils in places.

Lockport silt loam, loamy subsoil variant, 0 to 4 percent slopes (LpB).—This level to very gently sloping soil is on flat or nearly flat bedrock-controlled landscapes on upland till plains where runoff is slow or water accumulates. Individual areas are irregularly shaped, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of the similar but drier loamy subsoil variant of Lairdsville soils on higher areas or on breaks between different levels of Lockport soils. Also included were spots of deeper Appleton soils, small areas that are less than 20 inches or more than 40 inches deep over shale bedrock, and small areas of a similar soil that formed in greenish-gray shale and has olive rather than reddish hues.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, wetness delays planting and the choice of crops is limited. Drainage measures are generally difficult to install because of the erratic depth to bedrock. During dry periods lack of moisture is limiting to plant growth, due to the shallow rooting depth. Capability unit IIIw-2; woodland suitability group 3w3.

Lyons Series

The Lyons series consists of deep, poorly drained and very poorly drained, medium-textured soils that formed in strongly calcareous, loamy glacial till derived mainly from limestone, sandstone, and shale, These soils are nearly level or depressional and are on upland till plains where runoff is very slow or water accumulates. They are high in lime.

In a representative profile the surface layer is black mucky silt loam that contains a few gravelly fragments and is about 6 inches thick. The upper part of the subsoil is mottled, gray, firm heavy silt loam about 13 inches thick that contains a few gravelly fragments and is neutral. Between depths of 19 and 24 inches, the subsoil is mottled, gray, firm, calcareous gravelly silt loam. At a depth of 24 inches, it merges with the dense, calcareous till substratum of firm gravelly silt loam that is dark grayish brown, gray, and yellowish brown in color, and extends to a depth of 50 or more inches.

The water table is perched over the dense, slowly or very slowly permeable substratum, and is at or near the surface during much of the year. Unless drained, maximum rooting depth is mainly 10 to 15 inches. Few roots penetrate below this depth. Available water capacity in the rooting zone is moderate to low, but normally more than enough moisture is available for plant growth. Available nitrogen is high, but it is released slowly because of the wet condition of these soils. Available potassium is high, and available phosphorus is medium. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Excess water is the principal limitation to use of these soils for farming.

Representative profile of Lyons mucky silt loam in idle land in town of Warren, 125 feet west of New York State Highway 167, and 0.12 mile south of the intersection of New York State Highway 167 and Hicks Road:

Ap—0 to 6 inches, black (10YR 2/1), very dark gray (10YR 3/1) dry, mucky silt loam; weak, medium and coarse, granular structure; very friable; many medium and fine roots; few medium pores; few washed sand grains; 10 percent gravel; neutral; abrupt, smooth boundary.

B2g—6 to 19 inches, gray (10YR 5/1) heavy silt loam; common, medium, distinct yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; few medium roots; few medium pores; few sandstone remnants; few worm channels filled with material from the Ap horizon; 10 percent gravel; neutral; gradual, wavy boundary.

B3g—19 to 24 inches, gray (10YR 5/1) gravelly silt loam; many, medium, prominent, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; firm; few medium roots; few medium pores; 20 percent gravel; calcareous; mildly alkaline; gradual, wavy boundary.

C—24 to 50 inches, dark grayish-brown (10YR 4/2), gray (10YR 5/1), and yellowish-brown (10YR 5/6) gravelly silt loam; massive; firm; 30 percent gravel; calcareous; moderately alkaline.

The solum ranges from 20 to 35 inches in thickness. Depth to free carbonates ranges from 12 to 36 inches. Coarse fragments range from few to 30 percent in the top 10 to 40 inches, and from 20 to 50 percent below 40 inches.

The Ap or A1 horizons range from very dark gray (N 3/0) to very dark brown (10YR 2/2) in color. They are silt loam to sandy clay loam in texture, and weak granular in structure or structureless (massive). Reaction is slightly acid or neutral.

The B2g horizon ranges from light brownish gray (2.5Y 6/2) to gray (5YR 5/1) in color. It is friable to firm silt loam to loam, and ranges from moderate, angular to subangular blocky in structure. Reaction is neutral or mildly alkaline.

The C horizon is silt loam to sandy clay loam. It is firm to very firm in the basal till material. This horizon ranges from pale brown (10YR 6/3) to dark gray (5YR 4/1) in color and is calcareous. Contrasting types of soil material are in many profiles, and consist of thin surface deposits of local alluvium or lacustrine sediment up to 18 inches thick.

Lyons soils are the wet associate of the well-drained Honeoye and Ontario soils, the moderately well drained Lima and Hilton soils, and the somewhat poorly drained Appleton soils. They are also near Ilion and Cohoctah soils. Lyons soils lack the Bt horizon of Ilion soils, and are finer textured than the Cohoctah soils. Also, Lyons soils formed in till, in contrast to the alluvial deposits in which Cohoctah soils formed.

Lyons mucky silt loam (Ly).—This level or nearly level soil has a slope of less than 3 percent. It is on flat areas and depressions of upland till plains where runoff is very slow or water accumulates. Individual areas are irregularly shaped, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of drier Appleton soils on slight rises and knolls. Also included, mainly in the town of Frankfort, were spots of similar Ilion soils that have a fine-textured subsoil. Along drainageways, a few small areas of Cohoctah soils that flood were included. Other inclusions were spots that lack the mucky surface layer.

Unless drained, wetness limits the use of this soil for farming. It provides some pasture, and is suited to tree species that tolerate wetness. With adequate drainage it is suited to most crops grown in the area. Drainage outlets are difficult to locate in places. Capability unit IVw-1; woodland suitability group 4w1.

Manheim Series

The Manheim series consists of deep, somewhat poorly drained, medium-textured soils that formed in loamy glacial till rich in neutral to calcareous dark-colored shale. These soils are nearly level to moderately sloping and are on uplands where runoff is moderate or slow or where water accumulates. They are high to medium in lime.

In a representative profile the surface layer is very dark brown silt loam that contains a few shale fragments and is about 8 inches thick. The upper part of the subsoil is mottled, brown to dark-brown, friable silt loam about 10 inches thick that is neutral and contains a few shale fragments and some gravel. Below a depth of 18 inches and to a depth of 28 inches, the subsoil is mottled, dark grayish-brown, friable light silty clay loam that is neutral and contains a few shale fragments and some gravel. The lower part of the subsoil, between depths of 28 and 44 inches, is mottled, dark grayish-brown, friable silt loam that is neutral and contains noticeable amounts of shale fragments and gravel. At a depth of 44 inches, it merges with the calcareous substratum of mottled, dark grayish-brown, firm silt loam that contains noticeable amounts of shale fragments and gravel and extends to a depth of 50 or more inches.

In spring and during wet periods, Manheim soils have a seasonal high water table within 6 to 18 inches of the surface. It is perched on the slowly permeable substratum. Maximum rooting depth is mainly 20 inches and is strongly influenced by the water table. Few roots extend below this depth as the water table recedes. Available water capacity in the rooting zone is moderate to high. Available phosphorus is generally medium, and available potassium is high. Available nitrogen is high, but it is released slowly when the soils are wet and cold. Reaction in the surface layer is medium acid to neutral in unlimed areas. Excess water is one of the principal limitations to use of these soils for farming.

Representative profile of Manheim silt loam, 3 to 8 percent slopes, in hayfield in town of Little Falls, 200 feet southwest of New York State Highway 169 and 0.6 mile southeast of Eatonville:

Ap—0 to 8 inches, very dark brown (10YR 2/2), dark grayish-brown (10YR 4/2) dry and crushed silt loam; moderate, medium and fine, granular structure; very friable; many roots; 5 percent firm and very firm shale fragments; neutral; clear, smooth boundary.

B21—8 to 18 inches, silt loam that has dark grayish-brown (2.5Y 4/2) ped surfaces, brown to dark-brown (10YR 4/3) ped interiors; ped interiors have common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, fine and medium, subangular blocky structure; friable; common roots; common fine pores; clay films in depressions on vertical block faces and lining all pores; 5 percent firm and very firm very dark grayish-brown (10YR 3/2) shale fragments; 5 percent gravel; neutral; diffuse boundary.

B22t—18 to 28 inches, dark grayish-brown (10YR 4/2) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; friable; few tap roots of alfalfa; common fine pores; patchy clay films in more than 3 percent of both vertical and horizontal block faces and lining all pores; 10 percent firm and very firm, very dark grayish-brown (2.5Y 3/2) shale fragments; 5 percent gravel; neutral; diffuse boundary.

B3—28 to 44 inches, dark grayish-brown (10YR 4/2) silt loam; few, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few tap roots; common fine pores; clay films only in pores; 15 percent black (N 2/0) shale fragments; 10 percent gravel; neutral; clear, wavy boundary.

C—44 to 50 inches, dark grayish-brown (2.5Y 4/2) silt loam; few, fine, faint, yellowish-brown (10YR 5/6) mottles; very weak, thick, platy structure; firm; few pores; 15 percent firm and very firm, black (N 2/0) shale fragments; 15 percent gravel; calcareous; mildly alkaline.

The solum ranges from 24 to 45 inches in thickness and commonly corresponds to depth to free carbonates. Coarse fragments, including firm and very firm shale, range from 5 to 35 percent. The solum has moist color values of 4 or less that are uniform with depth in some profiles. Clay films are present on ped faces in some parts of the B horizon as well as the pores.

The Ap horizon has color values of 2 or 3; chroma is 1 or 2. Hues are 2.5Y or 10YR. This horizon ranges from weak to strong, granular in structure. Reaction is medium acid to neutral.

The B21 and B3 horizons are absent in some profiles. The B horizon has color values of 3 or 4; chroma is 2 or 3. Hues are 10YR or 2.5Y. This horizon has mottles that have color values of 4 or 5; chroma is 3 to 6. It is loam to light silty clay loam in texture and moderate to strong, fine to coarse, blocky in structure. Reaction is medium acid to neutral.

The C horizons have color values of 3 or 4; chroma is 2. Hues are 2.5Y or 10YR. These horizons are structureless (massive) or platy in structure, and are calcareous or have mildly alkaline to neutral reaction immediately below the B horizon.

Manheim soils formed in similar material and make up a drainage sequence with the well drained to moderately well drained Mohawk soils and the poorly drained Ilion soils. They are also near the somewhat poorly drained Appleton and Burdett soils, the somewhat poorly drained to poorly drained Massena soils, and the somewhat poorly drained to moderately well drained Mosherville soils. Manheim soils have darker colored profiles than all of these soils. Also, they lack the silty mantle of Burdett and the fragipan of Mosherville soils. Manheim soils have a Bt horizon that is lacking in Massena soils. In a few places they are near well drained Lansing and moderately well drained Conesus soils.

Manheim silt loam, 0 to 3 percent slopes (McA).—This level to nearly level soil is on ridgetops and in areas at the base of slopes of upland till plain landscapes where runoff is slow or water accumulates. Individual areas are irregularly shaped, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of wetter Ilion soils in depressions and along drainageways, a few small areas of Appleton soils south of the Mohawk River, and small areas that are moderately shallow over shale or limestone bedrock. Also included were spots of Burdett soils, mainly in the towns of Schuyler, Herkimer, and German Flatts, and spots of coarser textured Massena and Mosherville soils in the towns of Russia, Newport, Norway, Fairfield, and Salisbury.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, wetness delays planting and limits the choice of crops. Capability unit IIIw-1; woodland suitability group 3w1.

Manheim silt loam, 3 to 8 percent slopes (McB).—This gently sloping soil is on hilltops and foot-slope areas of upland till landscapes where runoff is moderate or water accumulates. Individual areas are irregularly shaped, and range from 5 to 50 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of better drained Mohawk and Conesus soils on higher areas, spots of wetter Ilion soils in depressions and along drainageways, a few spots of Appleton soils south of the Mohawk River, and areas of soils that are moderately shallow over shale or limestone bedrock. Small areas of Burdett soils were included, mainly in the towns of Schuyler, Herkimer, and German Flatts, and a few small areas of coarser textured Massena and Mosherville soils were included in the towns of Russia, Newport, Norway, Fairfield, and Salisbury.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, planting is delayed and the choice of crops limited. A hazard of erosion exists in cultivated areas that are unprotected. Capability unit IIIw-3; woodland suitability group 3w1.

Manheim silt loam, 8 to 15 percent slopes (McC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that the upper subsoil layer is thinner in places. It is on foot slopes of upland till landscapes where runoff water accumulates. Individual areas are elongated, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of better drained Mohawk and Lansing soils on higher landscapes, spots of wetter Ilion soils around seeps and along drainageways, small areas of Burdett soils in the towns of Schuyler, Herkimer, and German Flatts, a few spots of Appleton soils south of the Mohawk River, and small areas that are moderately shallow over shale or limestone bedrock.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is severe in cultivated areas that are unprotected. Also, seasonal wetness generally delays planting and limits the choice of crops. Capability unit IIIe-6; woodland suitability group 3w1.

Manlius Series

The Manlius series consists of moderately deep, well-drained to excessively drained, medium-textured soils that formed in thin glacial till derived mainly from underlying shale bedrock. The bedrock is 20 to 40 inches below the surface (fig. 11). These soils are gently sloping to moderately steep and are on upland till landscapes that are influenced by the underlying bedrock. They are very low in lime.

In a representative profile the surface layer is brown to dark-brown shaly silt loam about 9 inches thick. The upper part of the subsoil is yellowish-brown shaly silt loam about 5 inches thick that is strongly acid and very friable. Between depths of 14 and 21 inches, the subsoil is yellowish-brown, medium acid, very friable very shaly silt loam. The substratum, which is about 15 inches thick, begins at a depth of about 21 inches and is medium acid. It consists of a mass of fine, brittle shale fragments that have yellowish-brown silt loam filling the spaces between the fragments. At a depth of 36 inches, the substratum rests on very dark grayish-brown and dark-gray shale bedrock.

Figure 11.—Cut in a Manlius soil that shows the high content of shale fragments in these soils. Although obscured in this picture by the loose fragments, shale bedrock begins at a depth of 25 inches in this area.

The water table in Manlius soils is at a depth greater than 40 inches. Permeability of the solum is moderate. Maximum rooting depth is mainly 20 to 30 inches and is determined by the depth to bedrock. Available water capacity in the rooting zone is low to moderate. Available phosphorus is generally low, available potassium is medium to low, and available nitrogen is generally medium. Reaction in the surface layer is strongly acid or very strongly acid in unlimed areas. Strong acidity, low fertility, and lack of moisture are among the principal limitations to use of these soils for farming.

Representative profile of Manlius shaly silt loam, 3 to 8 percent slopes, in idle land in town of Stark, 60 feet north of Jordon Road, and 0.15 mile east of the intersection of Jordon and Wagner Hill Roads:

Ap—0 to 9 inches, brown to dark-brown (10YR 4/3), pale-brown (10YR 6/3) dry, shaly silt loam; weak, fine, granular structure; very friable; many medium and fine roots; 20 percent shale fragments; strongly acid; abrupt, smooth boundary.

B21—9 to 14 inches, yellowish-brown (10YR 5/4) shaly light silt loam; weak, fine, granular structure; very friable; few fine roots; 20 percent shale fragments; strongly acid; gradual, wavy boundary.

B22—14 to 21 inches, yellowish-brown (10YR 5/4) very shaly silt loam; weak, medium and fine, subangular blocky structure; very friable; few fine roots; 40 percent shale fragments; medium acid; gradual, wavy boundary.

C—21 to 36 inches, mass of fine brittle shale fragments, yellowish-brown (10YR 5/4) silt loam filling spaces between fragments; shale fragments total 75 percent of volume; medium acid; abrupt, smooth boundary.

R—36 inches +, very dark grayish-brown (10YR 3/2) and dark-gray (10YR 4/1) shale bedrock which can be cut with a spade with difficulty.

The solum ranges from 15 to 30 inches in thickness. Depth to shale bedrock ranges from 20 to 40 inches. In some profiles the C horizon is absent and the B2 horizon rests on bedrock. Reaction in the upper solum is very strongly acid and ranges from strongly acid to slightly acid over the bedrock. Coarse fragments more than 2 millimeters in diameter, consisting mostly of shale, are more than 35 percent in the solum and substratum. The texture is silt loam to loam. Hues are 10YR to 2.5Y. The Ap and A1 horizons have color values of 3 to 5; chroma is 2 or 3. The B2 and C horizons have color values of 4 to 6; chroma is 3 or 4. The solum is very friable to friable.

Manlius soils are geographically associated with Nassau, Hornell, Allis, and Lansing soils. They are similar to Nassau soils but are deeper. Manlius soils have a coarser textured B horizon than Hornell and Allis soils, and are better drained. They are more acid, shallower, and lack the Bt horizon of Lansing soils.

Manlius shaly silt loam, 3 to 8 percent slopes (MlB).—This gently sloping soil is on upland till landscapes that are influenced by underlying shale bedrock at depths of 20 to 40 inches. Individual areas are irregularly shaped and range from 5 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but shallower Nassau soils, spots of wetter Hornell and Allis soils in low areas, small areas that contain fewer shale fragments in the profile than normal, and areas that are deeper than 40 inches to bedrock.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. The soil has a tendency to be droughty, so measures to control erosion and conserve moisture are needed for good response. Capability unit IIe–2; woodland suitability group 3o1.

Manlius shaly silt loam, 8 to 15 percent slopes (MIC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that in places the upper part of the subsoil is thinner. It is on upland till landscapes that are influenced by underlying shale bedrock at depths of 20 to 40 inches. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but shallower Nassau soils and deeper and less acid Lansing soils, small areas that contain fewer shale fragments in the profile than normal, areas that are deeper than 40 inches to bedrock, and small areas where much of the original surface layer has been lost through erosion.

This soil is suited to most crops grown in the county and to hay, pasture, or trees; the hazard of erosion is severe in cultivated areas that are unprotected. It is generally droughty, so measures to control erosion and conserve moisture are necessary for good response. Capability unit IIIe–7; woodland suitability group 3o1.

Manlius shaly silt loam, 15 to 25 percent slopes (MID).—This moderately steep soil has a profile similar to the one described as representative for the series except that the upper part of the subsoil is thinner in places, and the surface layer usually contains a greater volume of shale fragments. It is on breaks, on upland till landscapes that are influenced by underlying shale bedrock. Individual areas are long and narrow, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but shallower Nassau soils, a few areas of deeper and less acid Lansing soils, spots where much of the original surface layer has been lost through erosion, and areas that are deeper than 40 inches to bedrock.

This soil is poorly suited to farming because of the moderately steep slopes and the very severe hazard of erosion. The use of machinery is difficult and hazardous. Tillage operations should largely be confined to renovation for hay or pasture. This soil is fairly well suited to trees. Capability unit IVe–5; woodland suitability group 3r1.

Massena Series

The Massena series consists of deep, somewhat poorly drained to poorly drained, medium-textured soils that formed in loamy glacial till derived from granitic material, sandstone, shale, and limestone. These soils are nearly level to gently sloping and are on upland till landscapes where runoff is slow to moderate or water accumulates. Massena soils are medium to high in lime.

In a representative profile the surface layer is very dark gray very fine sandy loam that contains some gravel and is about 8 inches thick. The subsurface layer is mottled, brown to dark-brown very fine sandy loam about 8 inches thick that contains some gravel and dark-colored shale fragments, and is very friable and slightly acid. Between depths of 16 and 28 inches, the upper part of the subsoil is mottled, dark grayish-brown, slightly acid, very friable gravelly and shaly loam. The lower part of the subsoil is mottled, brown to dark-brown, firm gravelly silt loam that is neutral and extends to a depth of about 36 inches. It is underlain by a substratum of mottled, firm silt loam that contains a few gravel and shale chips. The substratum is neutral to a depth of about 50 inches and becomes calcareous below.

Massena soils have a seasonal high water table that is within 12 inches of the surface for extended periods. It is perched on the slowly permeable substratum. Maximum rooting depth is determined by the water table and is mainly 15 to 20 inches unless the soil is drained. Available water capacity in the rooting zone is moderate to low, but normally more than enough moisture is available for plant growth. Available phosphorus is generally medium to low, and available potassium is medium. Available nitrogen is high, but it is released slowly when the soils are cold and wet. Reaction in the surface layer is medium acid to neutral in unlimed areas. Excess water is the principal limitation to use of these soils for farming.

Representative profile of Massena very fine sandy loam, 0 to 8 percent slopes, in a meadow in town of Fairfield, 90 feet south of Rath Road, and 0.13 mile east of the intersection of Rath and Castle Roads:

Ap—0 to 8 inches, very dark gray (10YR 3/1), light-gray (10YR 6/1) dry, very fine sandy loam; weak, medium and fine, granular structure; very friable; many medium and fine roots; 5 percent gravel; slightly acid; gradual, smooth boundary.

A2—8 to 16 inches, brown to dark-brown (10YR 4/3) very fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, thick, platy structure; very friable; few fine roots; common medium and coarse pores; 10 percent gravel and black shale fragments; slightly acid; gradual, wavy boundary.

B21—16 to 28 inches, dark grayish-brown (10YR 4/2) gravelly and shaly loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, subangular blocky structure that has dark grayish-brown (10YR 4/2) ped faces; common medium pores; 25 percent gravel, cobblestones, and black shale fragments; slightly acid; gradual, wavy boundary.

B22—28 to 36 inches, brown to dark-brown (10YR 4/3) gravelly silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) and few, fine, faint, light brownish-gray (10YR 6/2) mottles; moderate, coarse, angular blocky structure; firm; common medium pores; clay and/or silt films on a few ped surfaces; 15 percent gravel, cobblestones, and black shale fragments; neutral; gradual, wavy boundary.

C—36 to 50 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, faint, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; massive; firm; 10 percent gravel and black shale fragments; many fine mica flakes; neutral, becoming calcareous at depth of 50 inches.

The solum ranges from 18 to 36 inches in thickness. The depth to free carbonates ranges from 20 to 50 inches. Coarse fragments range from 5 to 35 percent. Hues range from 10YR to 2.5Y throughout the solum and substratum.

The Ap horizon has color values of 3 or 4; chroma is 1 or 2. It ranges from weak, granular to subangular blocky in structure, and reaction is medium acid to neutral.

The A2 horizon has color values of 4 to 6; chroma is 3 or 4. It is silt loam to sandy loam in texture, and ranges from weak, platy to subangular blocky in structure. Reaction is medium acid to neutral. Distinct, high-chroma mottles commonly are in the A2 horizon.

The B2 horizon is friable to firm silt loam to sandy loam. It has color values of 3 to 5; chroma is 2 to 4. It ranges from blocky in structure to structureless (massive). Reaction is medium acid to neutral. Both high- and low-chroma mottles are in the B2 horizon in places.

The C horizon has about the same hue, value, and chroma as the B horizon. It is silt loam to sandy loam. Reaction is neutral or moderately alkaline.

Some Massena soils in Herkimer County have darker color values and higher silt content in the B and C horizons than is defined as the range for the series. These differences do not alter their usefulness and behavior.

Massena soils formed in similar material and make up a drainage sequence with the moderately well drained Bombay and the very poorly to poorly drained Sun soils. They are also geographically associated with Canton, Ilion, Manheim, and Mosherville soils. Massena soils contain less clay than Ilion and Manheim soils. They are wetter than Canton soils and lack the fragipan of Mosherville soils.

Massena very fine sandy loam, 0 to 8 percent slopes (MnB).—This nearly level to gently sloping soil is on ridgetops and concave side slopes on upland till landscapes. Runoff is slow to moderate, or water accumulates. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of better drained Bombay and Canton soils on higher areas, wetter Sun soils in lower areas and along drainageways, small spots of similar but finer textured Manheim and Ilion soils, and small areas of Mosherville soils that have a fragipan.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, wetness delays planting and limits the choice of crops. Also, the more sloping areas are subject to erosion in cultivated areas that are unprotected. Capability unit IIIw-3; woodland suitability group 3w2.

Mohawk Series

The Mohawk series consists of deep, well drained to moderately well drained, medium-textured soils that formed in loamy glacial till deposits derived mainly from dark-colored calcareous shale. In Herkimer County this dark-colored shale bedrock is at a depth of 40 to 60 inches. These soils are gently sloping to moderately steep and are on upland till landscapes. They are high in lime.

In a representative profile the surface layer is very dark brown silt loam about 11 inches thick. It is underlain between depths of 11 inches and 35 inches by a neutral subsoil in which the shale fragment content increases from few to common with depth. To a depth of 18 inches, the upper part of the subsoil is very dark grayish-brown, very friable silt loam. Between depths of 18 and 25 inches, it consists of black, friable heavy silt loam. Between depths of 25 and 35 inches, the subsoil is mottled, black, friable shaly silt loam. At a depth of 35 inches, it merges with a firm, calcareous substratum of mottled, very dark gray shaly silt loam that extends to a depth of 45 inches. Below this is dark-colored, calcareous bedrock.

In spring and during wet periods, some Mohawk soils have a seasonal high water table within 24 to 30 inches of the surface. It is perched on the slowly permeable substratum. In places, the water table is at greater depths or is not present above bedrock. Maximum rooting depth is 24 to 30 inches or more. Available water capacity is high. Available phosphorus and nitrogen are generally medium, and available potassium is high. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Other than slope and the hazard of erosion, few limitations to use of these soils for farming exist.

Representative profile of Mohawk silt loam, shale substratum, 3 to 8 percent slopes, in a hayfield in town of Little Falls, 435 feet west of Reservoir Road, 0.25 mile north of the intersection of Dise and Reservoir Roads:

Ap—0 to 11 inches, very dark brown (10YR 2/2), gray (10YR 5/1) dry, silt loam; moderate, medium and coarse, granular structure; friable; common medium and fine roots; common medium pores; few, washed sand grains; horizon somewhat compacted from tillage; neutral; abrupt, smooth boundary.

B1—11 to 18 inches, very dark grayish-brown (10YR 3/2), grayish-brown (10YR 5/2) dry, silt loam; moderate, medium and coarse, subangular blocky structure; very friable; few medium and fine roots; common medium pores; few, washed sand grains; 10 percent soft shale chips; neutral; gradual, wavy boundary.

B21t—18 to 25 inches, black (10YR 2/1), gray (10YR 5/1) dry, heavy silt loam; strong, medium, subangular blocky structure; friable; few fine roots; many medium pores; scattered clay films on ped surfaces and in pores; 14 percent soft shale chips; neutral; gradual, wavy boundary.

B22t—25 to 35 inches, black (10YR 2/1), dark-gray (10YR 4/1) dry, shaly heavy silt loam; common, medium, faint, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; friable; many medium pores; scattered clay films on ped surfaces and in pores; 20 percent soft shale chips; neutral; gradual, wavy boundary.

C—35 to 45 inches, very dark gray (10YR 3/1), dark-gray (10YR 4/1) dry, shaly silt loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; firm; 30 percent soft shale chips; calcareous; moderately alkaline.

R—45 inches +, black (10YR 2/1), calcareous, soft shale bedrock.

The solum ranges from 24 to 45 inches in thickness. The depth to black shale bedrock ranges from 40 to 60 inches. The depth to free carbonates ranges from 24 to 60 inches. Reaction is slightly acid to mildly alkaline. Hues are predominantly 10YR, but range to 2.5Y. The solum has color values of 2 to 4; chroma is 1 to 3. Hard granite, sandstone, or limestone cobblestones, gravel, or stones range from 0 to 20 percent. The B2t horizon is silt loam to silty clay loam. Shale fragments range from few to 25 percent. High-chroma mottles may occur in the profile below depths of 20 inches in places. Patchy clay films are in the pores and on ped faces in the B2t horizons. The B2t horizons range from moderate to strong subangular blocky in structure. The C horizon is shaly silt loam to shaly clay loam. It is generally a mixture of silt and soft shale chips.

Mohawk soils formed in similar material and make up a drainage sequence with the somewhat poorly drained Manheim soils and the poorly drained Ilion soils. They are also closely associated with Palatine soils that are 20 to 40 inches deep over dark-colored shale, and lack the Bt horizon of Mohawk soils. Mohawk soils are also near Honeoye, Lansing, Conesus, and Broadalbin soils, all of which lack dark colors in the B and C horizons inherited from shale. Also, Mohawk soils lack the fragipan of Broadalbin soils.

Mohawk silt loam, shale substratum, 3 to 8 percent slopes (MoB).—This gently sloping soil is on upland till landscapes where dark-colored calcareous shale bedrock is at a depth of 40 to 60 inches. Individual areas are irregularly shaped, and range from 5 to 50 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but moderately deep Palatine soils, spots of wetter Manheim and Ilion soils in low areas and along drainageways, small areas where the depth to bedrock is greater than 60 inches, and areas of Honeoye, Conesus, and Broadalbin soils that lack the dark-colored shale content of Mohawk soils.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Crops respond very well to applications of fertilizer according to soil tests. In places, slight wetness delays planting briefly. Capability unit IIe–1; woodland suitability group 2o1.

Mohawk silt loam, shale substratum, 8 to 15 percent slopes (MoC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that in places the upper part of the subsoil is thinner. It is on upland till landscapes where dark-colored calcareous shale bedrock is at depths of 40 to 60 inches. Individual areas are irregularly shaped, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of similar but moderately deep Palatine soils; spots of wetter Manheim and Ilion soils on low areas, around seeps, and along drainageways; small areas that are deeper than 60 inches over bedrock; and spots of Honeoye, Lansing, and Broadalbin soils that lack the dark-colored shale content of Mohawk soils.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Crops respond very well to applications of fertilizer according to soil tests. Capability unit IIIe–1; woodland suitability group 2o1.

Mohawk silt loam, shale substratum, 15 to 25 percent slopes (MoD).—This moderately steep soil has a profile similar to the one described as representative for the series except that the upper part of the subsoil is thinner in places. It is on upland till landscapes where dark-colored calcareous shale bedrock is at a depth of 40 to 60 inches. Individual areas are elongated, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of similar but moderately deep Palatine soils, a few small areas of wetter Manheim soils around seeps and along foot slopes, spots that are deeper than 60 inches over bedrock, small areas of Honeoye, Lansing, and Broadalbin soils that lack the dark-colored shale content of Mohawk soils, and areas where much of the original surface layer has been lost through erosion.

This soil is poorly suited to farming because of slope and the very severe hazard of erosion. The use of machinery is difficult and hazardous. Tillage operations should largely be confined to renovation for hay or pasture. This soil is well suited to high-yield varieties of alfalfa. Capability unit IVe–1; woodland suitability group 2r1.

Mosherville Series

The Mosherville series consists of deep, somewhat poorly drained, medium-textured soils that have a fragipan at a depth of 14 to 30 inches. They formed in silty surficial deposits, presumably of eolian origin, and glacial till derived from granite, gneiss, sandstone, and a significant amount of dark-colored shale. They are nearly level to gently sloping and are on upland till landscapes where runoff is moderate or water accumulates. Mosherville soils are low in lime.

In a representative profile the surface layer is very dark grayish-brown very fine sandy loam about 9 inches thick. Between depths of 9 and 21 inches, the upper part of the subsoil is very friable, medium acid very fine sandy loam. It is mottled dark grayish brown in the upper 4 inches, and below a depth of 13 inches is mottled brown to dark brown. The lower part of the subsoil, which is a firm and brittle fragipan, begins at a depth of 21 inches. It consists of yellowish-brown and grayish-brown fine sandy loam to a depth of 29 inches. Between depths of 29 and 40 inches, it is mottled, brown to dark-brown, medium acid light silt loam. Noticeable amounts of gravel and dark-colored shale fragments are present throughout. At a depth of about 40 inches, the subsoil merges with a substratum of firm, strong-brown, and gray to light-gray, neutral silt loam that contains some gravel and dark-colored shale fragments and extends to a depth of 50 or more inches.

In spring and during wet periods, Mosherville soils have a seasonal high water table within 6 to 18 inches of the surface. This water table is perched on the slowly permeable fragipan and dense till substratum. Maximum rooting depth is determined by the depth to the fragipan and water table. Early in the season it is mainly 15 to 20 inches. Few roots extend below this as the season progresses. Available water capacity in the rooting zone is moderate. Available phosphorus is generally low, and available potassium is medium. Available nitrogen is generally high, but it is released slowly when the soils are cold and wet. Reaction in the surface layer is strongly acid to slightly acid in unlimed areas. Excess water is the principal limitation to use of these soils for farming.

Representative profile of Mosherville very fine sandy loam, 2 to 8 percent slopes, in a meadow in town of Salisbury, 0.78 mile northwest of the intersection of Mexico and Dairy Hill Roads near Dairy Hill Road:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2), light brownish-gray (2.5Y 6/2) dry, very fine sandy loam; weak, medium and coarse, granular structure; very friable; many fine roots; few medium pores; few, washed sand grains; 10 percent gravel; medium acid; gradual, smooth boundary.

B1—9 to 13 inches, dark grayish-brown (10YR 4/2) crushed, very fine sandy loam; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; very friable; common fine roots; common medium pores; few, washed sand grains; 10 percent gravel; medium acid; gradual, wavy boundary.

B2—13 to 21 inches, brown to dark-brown (10YR 4/3) very fine sandy loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; very friable; scattered, washed sand grains; common fine roots; common medium and fine pores; 10 percent gravel; medium acid; gradual, wavy boundary.

Bx1—21 to 29 inches, 50 percent yellowish-brown (10YR 5/6), 50 percent grayish-brown (10YR 5/2), fine sandy loam; strong, thick, platy structure; firm; brittle; few fine roots; few medium and fine pores; 10 to 15 percent gravel and black shale fragments; medium acid; gradual, wavy boundary.

Bx2—29 to 40 inches, brown to dark-brown (10YR 4/3) light silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) and gray (10YR 5/1) mottles;

weak, coarse, subangular blocky structure; firm; brittle; 10 percent gravel and black shale fragments; medium acid; gradual, wavy boundary.

C—40 to 50 inches, 50 percent strong-brown (7.5YR 5/6), 50 percent gray to light-gray (10YR 6/1) silt loam; massive; firm; 5 percent gravel and scattered, small, black shale chips; neutral.

The solum ranges from 40 to 50 inches in thickness. The depth to the fragipan ranges from 14 to 30 inches. Surficial deposits range from 12 to 36 inches in thickness. Coarse fragments range from 1 to 25 percent in the part above the fragipan and from 5 to 30 percent in the fragipan and C horizon.

The Ap horizon has hues of 10YR or 2.5Y and values of 3 or 4; chroma is 2 or 3. Reaction is strongly acid to slightly acid.

The B horizons are silt loam to very fine sandy loam. Hues are 10YR or 2.5Y. These horizons have color values of 4 or 5; chroma is 2 or 3. They are weak, granular to subangular blocky in structure. Reaction is strongly acid to slightly acid.

The Bx horizons have color values of 3 to 5; chroma is 2 to 5. Hues are 10YR or 2.5Y. These horizons are fine sandy loam to light silt loam in texture; firm to very firm, brittle in consistence; and range from prismatic to platy in structure. Reaction is neutral to medium acid.

The C horizon is silt loam to fine sandy loam. It has hues of 10YR or 2.5Y and values of 4 to 6; chroma is 1 to 6. High- and low-chroma mottles are in the Bx and C horizons. Reaction is slightly acid to neutral. Contrasting material commonly is present between the B and Bx horizons.

Mosherville soils formed in similar material and make up a drainage sequence with the well drained to moderately well drained Broadalbin soils. They are also the better drained associate of the very poorly to poorly drained Sun soils that lack the fragipan of Mosherville soils. Mosherville soils are near Massena and Manheim soils in places. They are more acid and have a fragipan that is lacking in these soils.

Mosherville very fine sandy loam, 2 to 8 percent slopes (MsB).—This nearly level to gently sloping soil is on upland till landscapes where runoff is slow to moderate or water accumulates. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but better drained Broadalbin soils on higher topography, small areas of wetter Sun soils in depressions and along drainageways, and small areas of Massena and Manheim soils that lack the fragipan of Mosherville soils. In a few places, small areas that have silt loam and loam surface layers were included.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, wetness delays planting and limits the choice of crops. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Capability unit IIIw-5; woodland suitability group 3w3.

Nassau Series

The Nassau series consists of shallow, somewhat excessively drained, medium-textured soils that formed in thin glacial till derived mainly from underlying shale bedrock at a depth of 8 to 20 inches. They are gently sloping to moderately steep and are on upland till landscapes that are influenced by the bedrock. They are very low in lime.

In a representative profile the surface layer is brown to dark-brown silt loam that contains a noticeable amount of shale fragments and is about 6 inches thick. The subsoil is brown to dark-brown, very friable very shaly silt loam about 11 inches thick. Reaction is medium acid in the upper part of the subsoil as a result of liming, and becomes strongly acid with increasing depth. Between depths of 17 and 19 inches, a thin substratum is just over the shale bedrock. The shale bedrock is brown, strongly acid, very friable very shaly silt loam that contains about 70 percent shale fragments. It is at a depth of 19 inches.

A water table is not observed within the profile of Nassau soils. Permeability is moderate throughout. Maximum rooting depth is confined mainly to the 8 to 20 inches above bedrock. Available water capacity is low or very low. Available phosphorus is generally low, available potassium is medium to low, and available nitrogen is generally medium. Reaction in the surface layer is strongly acid or very strongly acid in unlimed areas. Droughtiness, low fertility, and shallow depth are among the principal limitations to use of these soils for farming.

Representative profile of Nassau silt loam, 8 to 15 percent slopes, in a pasture in town of Herkimer, 70 feet west of Steuben Hill Road, and 0.4 mile south of the intersection of Steuben Hill and Cook Hill Roads:

Ap—0 to 6 inches, brown to dark-brown (10YR 4/3), pale-brown (10YR 6/3) dry, silt loam; weak, fine, granular structure; very friable; many fine roots; common medium pores; 10 percent small shale chips; medium acid; abrupt, smooth boundary.

B21—6 to 12 inches, brown to dark-brown (10YR 4/3) very shaly silt loam; weak, medium, subangular blocky structure; very friable; common fine roots; few medium pores; 35 percent shale chips; medium acid; gradual, smooth boundary.

B22—12 to 17 inches, brown (10YR 5/3) very shaly silt loam; weak, medium to coarse, subangular blocky structure; very friable; 40 percent shale chips up to 2 inches in diameter; strongly acid; gradual, wavy boundary.

C—17 to 19 inches, brown (10YR 5/3) very shaly silt loam; weak, medium, platy structure to structureless (massive); very friable; 70 percent shale fragments; strongly acid; abrupt, smooth boundary.

R—19 inches +, medium hard shale bedrock, strongly acid.

The thickness of the solum and the depth to bedrock range from 8 to 20 inches. Shale fragments average 35 to 70 percent in the area below the Ap or A1 horizon. Reaction in the solum and substratum is very strongly acid to strongly acid, if unlimed. Hue ranges from 10YR to 2.5Y. The texture is loam to silt loam. The Ap or A1 horizon has color values of 3 to 5; chroma is 2 or 3. It is weak, granular in structure. The B horizon has color values of 4 to 5; chroma is 3 or 4. It ranges from weak, blocky structure to structureless (massive). The C horizon, where present, consists primarily of a mixture of silt and shale fragments with color values and chromas like those of the B horizon. The shale bedrock ranges from medium to hard. When moist it can generally be cut with a spade with some difficulty.

Nassau soils are closely associated geographically with similar Manlius soils that are well drained to excessively drained and are 20 to 40 inches deep over shale bedrock. They are also near Hornell and Allis soils. Nassau soils are shallower over shale bedrock, have coarser textured B and C horizons, and are better drained than Hornell and Allis soils.

Nassau silt loam, 3 to 8 percent slopes (NaB).—This gently sloping soil is on crests of ridges and side slopes of upland till landscapes that are influenced by underlying shale bedrock. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but moderately deep Manlius soils, spots of wetter Hornell and Allis soils in low areas and along drainageways, and small areas that contain fewer shale fragments in the profile than normal.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. It is droughty and has low fertility. The hazard of erosion is moderate in cultivated areas that are unprotected. Capability unit IIIs-2; woodland suitability group 4d1.

Nassau silt loam, 8 to 15 percent slopes (NaC).—This moderately sloping soil is on side slopes of upland till landscapes that are influenced by underlying shale bedrock. Individual areas are elongated and range from 5 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but moderately deep Manlius soils, areas that are less than 8 inches thick over the bedrock, a few spots of wetter Hornell soils, small areas that contain fewer shale fragments than normal in the profile, and areas where much of the original surface soil has been lost through erosion.

This soil is poorly suited to farming because of the severe hazard of erosion, droughtiness, and low fertility. It is suited to early pasture and to trees. Capability unit IVe-5; woodland suitability group 4d1.

Nassau silt loam, 15 to 25 percent slopes (NaD).—This moderately steep soil has a profile similar to the one described as representative for the series except that in places the subsoil is thinner and the surface layer contains more shale fragments. It is on side slopes of upland till landscapes that are influenced by underlying shale bedrock. Individual areas are elongated, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but moderately deep Manlius soils, areas that are less than 8 inches thick over bedrock, a few spots of wetter Hornell soils, small areas that contain fewer shale fragments than normal in the profile, and areas where much of the original surface layer has been lost through erosion.

This soil is poorly suited to farming because of slope, the severe hazard of erosion, droughtiness, and low fertility. Tillage operations should be largely confined to renovation for hay or pasture. The soil is suited to tree species that tolerate dryness. Capability unit IVe-5; woodland suitability group 4x1.

Ontario Series

The Ontario series consists of deep, well-drained, medium-textured soils that formed in loamy glacial till derived mainly from limestone and sandstone having some shale. These soils are gently sloping to moderately steep and are on upland areas in the western part of the county south of the Mohawk River. They are medium to high in lime.

In a representative profile the surface layer is dark-brown silt loam about 9 inches thick that contains a noticeable amount of gravel. It is underlain by brown to dark-brown, neutral, friable gravelly silt loam that is 6 inches thick. A neutral subsoil is observed between depths of 15 and 31 inches. To a depth of 23 inches, it consists of friable, dark reddish-brown gravelly silt loam. From 23 to 31 inches, it is friable, reddish-brown gravelly loam. The subsoil is underlain by a neutral substratum of very firm, dark reddish-brown gravelly silt loam that extends to a depth of 50 inches or more.

The water table in Ontario soils begins at a depth of 30 inches to several feet. Permeability is moderate in the surface layer and subsoil, and slow or very slow in the substratum. Maximum rooting depth is mainly 30 inches. Few roots extend below this depth. Available water capacity in the rooting zone is moderate. Available phosphorus and nitrogen are generally medium, and available potassium is high. Reaction in the surface layer is medium acid to neutral in unlimed areas. Aside from slope and the hazard of erosion, few limitations to use of these soils for farming exist.

Representative profile of Ontario silt loam, 15 to 25 percent slopes, in idle field of grass in town of Frankfort, 225 feet south of Higby Road, and 0.27 mile west of Stewart Corners:

Ap—0 to 9 inches, dark-brown (7.5YR 3/2), brown (10YR 5/3) dry, silt loam; weak, medium and coarse, granular structure; friable; many coarse and fine roots; common medium and fine pores; few, washed sand grains; 10 percent gravel; slightly acid; abrupt, smooth boundary.

A&B—9 to 15 inches, brown to dark-brown (7.5YR 4/4) gravelly silt loam; weak, medium, subangular blocky structure; friable; common fine roots; many medium pores; few, washed sand grains; horizon consists of A2 interfingering into B21t; 20 percent gravel; neutral; gradual, wavy boundary.

B21t—15 to 23 inches, dark reddish-brown (5YR 3/4) gravelly silt loam; weak, coarse, subangular blocky structure; friable; few fine roots; common medium pores; patchy clay films on ped faces and in pores; 20 percent gravel; neutral; gradual, wavy boundary.

B22t—23 to 31 inches, reddish-brown (5YR 4/3) gravelly loam; weak, coarse, subangular blocky structure; friable; few fine roots; common medium pores; soft, reddish-brown and brown, shale chips scattered throughout horizon; 30 percent gravel; patchy clay films on ped faces and in pores; neutral; gradual, wavy boundary.

C—31 to 50 inches, dark reddish-brown (5YR 3/3) gravelly silt loam; massive; very firm; abundant, red, brown, and rust-colored, shale chips scattered throughout horizon; 30 percent gravel and shale fragments; neutral.

The solum ranges from 30 to 48 inches in thickness. The depth to sandstone bedrock ranges from 40 inches to many feet. Coarse fragments include gravel, cobblestones, and angular fragments that have small amounts of shale, and range from none in the upper part to up to 35 percent in the lower solum and substratum. The coarse material consists mostly of red and brown sandstone.

The Ap horizon has color values of 3 to 5; chroma is 2 or 3. Hues are 10YR or 7.5YR. This horizon is very fine sandy loam to silt loam in texture, and is weak, granular in structure. Reaction is medium acid to neutral.

The A2 horizon, which interfingers into the B2t horizon to form an A&B horizon in many profiles, extends to depths ranging from 14 to 21 inches. It has color values of 4 to 6; chroma is 2 to 4. Hues are 10YR or 7.5YR. This horizon is silt loam to loam. It ranges from weak, platy to subangular blocky in structure. Reaction is medium acid to neutral.

The B2t horizon has color values of 3 to 5; chroma is 2 to 4. Hues range from 5YR to 10YR. It is weak to moderate, angular to subangular blocky in structure and has patchy clay films on ped faces and in pores. Reaction is medium acid to neutral.

The C horizon is firm to extremely firm silt loam to loam glacial till. It has color values of 3 to 5; chroma is 2 or 3. Hues range from 5YR to 10YR. Reaction is neutral to moderately alkaline.

Ontario soils formed in similar material and make up a drainage sequence with the moderately well drained Hilton, the somewhat poorly drained Appleton, and the poorly and very poorly drained Lyons soils. They are also near Honeoye, Lansing, and Conesus soils. Ontario soils have redder hues than all of these soils. They are more acid than Honeoye soils, and are better drained and lack the high-chroma mottles in the Bt horizons of Conesus soils.

Ontario silt loam, 3 to 8 percent slopes (OnB).—This gently sloping soil has a profile similar to the one described as representative for the series except that the surface layer is generally a little darker in color. It is on side slopes and ridgetops on upland till landscapes. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar, but wetter, Appleton, Hilton, and Lyons soils in lower areas. Also included, mainly in the towns of Litchfield and Columbia, were spots of less acid Honeoye soils. In a few areas in the town of Frankfort, wetter Conesus soils were included. Other inclusions were a few spots that have a firm brittle fragipan in the lower part of the subsoil.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Crops respond well to applications of fertilizer according to soil tests. Capability unit IIe–1; woodland suitability group 2o1.

Ontario silt loam, 8 to 15 percent slopes (OnC).—This moderately sloping soil is on side slopes of upland till landscapes. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but moderately well drained Hilton soils in lower areas, spots of less acid Honeoye soils, mainly in the towns of Litchfield and Columbia, spots of more silty Lansing soils in the town of Frankfort, and a few small areas that have a firm brittle fragipan in the lower part of the subsoil.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Crops respond well to applications of fertilizer according to soil tests. Capability unit IIIe–1; woodland suitability group 2o1.

Ontario silt loam, 15 to 25 percent slopes (OnD).—This moderately steep soil is on side slopes of upland till landscapes. Individual areas are long and narrow, and range from 5 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but moderately well drained Hilton soils in low areas, spots of less acid Honeoye soils, mainly in the towns of Litchfield and Columbia, spots of more silty Lansing soils in the town of Frankfort, and a few areas that have a firm brittle fragipan in the lower subsoil.

This soil is poorly suited to farming because of slope and the hazard of erosion. It is difficult and hazardous to work with machinery. Tillage operations should be largely confined to renovations for hay or pasture. This soil is well suited to high-yield varieties of alfalfa. It is also well suited to trees. Capability unit IVe–1; woodland suitability group 2r1.

Palatine Series

The Palatine series consists of moderately deep, well-drained to somewhat excessively drained, medium-textured soils that formed in thin glacial till derived mainly from underlying, dark-colored shale bedrock that is weakly consolidated and calcareous. These soils are gently sloping to moderately steep and are on glacially modified, bedrock-controlled landforms. They are high in lime.

In a representative profile the surface layer is black silt loam that is about 7 inches thick and contains a noticeable amount of dark-colored shale chips. The subsoil, between depths of 7 and 17 inches, is neutral, friable, black very shaly silt loam. Between depths of about 17 and 22 inches is a very dark brown substratum that is about 80 percent fractured shale fragments that have silt loam filling the spaces between fractures. The interiors of the fragments are calcareous. Dark, calcareous shale bedrock that can be cut with a spade begins at a depth of about 22 inches.

The water table in Palatine soils is at a depth of at least 30 inches, but generally at much greater depths. Maximum rooting depth is determined by depth to bedrock. Few roots penetrate deeper than 30 inches. Available water capacity is moderate. Available phosphorus and nitrogen generally are medium, and available potassium is high. Reaction in the surface layer is usually neutral in unlimed areas. In the shallower areas, lack of available water is one of the principal limitations to use of these soils for farming.

Representative profile of Palatine silt loam, 2 to 8 percent slopes, in a hayfield in town of Fairfield, 60 feet northeast of intersection of Arnold Road and New York State Highway 169:

Ap—0 to 7 inches, black (10YR 2/1), grayish-brown (10YR 5/2) dry, silt loam; moderate, medium and fine, subangular blocky structure; friable; many medium and fine roots; 15 percent shale fragments; neutral; abrupt, smooth boundary.

B2—7 to 17 inches, black (10YR 2/1), grayish-brown (10YR 5/2) dry, very shaly silt loam; moderate, medium and fine, subangular blocky structure; friable; common medium and fine roots; 35 percent shale fragments; neutral; gradual, smooth boundary.

C—17 to 22 inches, very dark brown (10YR 2/2), dark-gray (10YR 4/1) dry, shale fragments that have 20 percent interspersed silt loam like that in the B horizon; weak, medium, platy structure; friable; interiors of shale fragments are calcareous; gradual, smooth boundary.

R—22 inches +, black and very dark brown, soft shale; calcareous; can be penetrated with spade with difficulty.

The solum ranges from 15 to 30 inches in thickness. The depth to shale bedrock ranges from 20 to 40 inches. Soft shale fragments average more than 35 percent from the Ap horizon to the shale bedrock. Free carbonates are present in the soil mass, or in the shale fragments and the shale bedrock. Hues are 10YR or 2.5Y. The solum has color values of 2 to 4; chroma is 1 to 3. The B horizon is no darker in color and has less than 1 percent more organic material than the C horizon, or than the R horizon if the C horizon is absent. The texture is loam to heavy silt loam in all horizons above the C horizon. The Ap or A1 horizons are granular in structure; the B horizon is subangular blocky.

Palatine soils are near well drained to moderately well drained Mohawk and somewhat poorly drained Manheim soils that formed in similar dark-colored shale materials. They are shallower to bedrock and have a higher average content of dark-colored shale in the B and C horizons than either Mohawk or Manheim soils. Also, Palatine soils lack the Bt horizons of Mohawk or Manheim soils. In places, Palatine soils are near Honeoye and Lansing soils, which are also deeper, and have Bt horizons that are lacking in Palatine soils.

Palatine silt loam, 2 to 8 percent slopes (PaB).—This gently sloping soil is on glacially modified, bedrock-controlled landscapes on uplands. Individual areas are irregularly shaped, and range from 5 to 25 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of deeper Mohawk soils and wetter and deeper Manheim soils, spots of deeper Honeoye soils in the towns of Columbia and Warren, and areas of Lansing soils in the towns of Herkimer and Fairfield. Other inclusions were small areas that are shallower than 20 inches to bedrock, areas that are less shaly, and areas where the shale rock is neutral in reaction.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Lack of moisture is a limiting factor in the shallower areas in places. Capability unit IIe-1; woodland suitability group 2o1.

Palatine silt loam, 8 to 15 percent slopes (PaC).—This moderately sloping soil is on glacially modified, bedrock-controlled landscapes on uplands. Individual areas are irregularly shaped, and range from 5 to 25 acres.

Included with this soil in mapping were small areas of deeper Mohawk soils and wetter and deeper Manheim soils, spots of deeper Honeoye soils in the towns of Columbia and Warren, and spots of deeper Lansing soils in the towns of Herkimer and Fairfield. Other inclusions were small areas that are shallower than 20 inches to bedrock, areas that are less shaly, and areas where the shale rock is neutral in reaction.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. Lack of moisture is a limiting factor in the shallower areas in places. Capability unit IIIe-1; woodland suitability group 2o1.

Palatine silt loam, 15 to 25 percent slopes (PaD).—This moderately steep soil has a profile similar to the one described as representative for the series except that the surface layer usually contains more shale fragments. It is on glacially modified, bedrock-controlled landscapes on uplands. Individual areas are long and narrow along escarpments, and range from 3 to 20 acres.

Included with this soil in mapping were small areas of deeper Mohawk soils, spots of deeper Honeoye soils, mainly in the towns of Columbia and Warren, and areas of deeper Lansing soils, mainly in the towns of Herkimer and Fairfield. Other inclusions were small areas that are shallower than 20 inches over shale bedrock, and areas where the shale is neutral in reaction.

This soil is suited to hay, pasture, or trees. It is poorly suited to farming because of the moderately steep slopes, rapid runoff, and severe hazard of erosion. Tillage operations should largely be confined to renovation for hay or pasture. The use of machinery is difficult and hazardous. Capability unit IVe-1; woodland suitability group 2r5.

Palms Series

The Palms series consists of deep, very poorly drained soils that are 16 to 50 inches of organic material underlain by loamy mineral soil layers. The organic matter is slightly acid to neutral. The mineral soil material is neutral or calcareous. These soils are nearly level and are on till plains, lake plains, and flood plains in basin areas that were formerly ponded.

In a representative profile the surface layer is black, well-decomposed organic material about 11 inches thick. It is underlain by a layer of black, well-decomposed organic material containing some silt. This layer is neutral, very friable, and extends to a depth of about 17 inches. Below this, the upper part of the substratum is mottled, very dark gray, neutral, firm heavy silt loam about 4 inches thick. At a depth of about 21 inches and extending to a depth of 50 or more inches, the substratum consists of mottled, dark grayish-brown, firm, calcareous gravelly silt loam.

In Palms soils the water table is on or near the surface during most of the year. Rooting is strongly influenced by the depth to the water table. Few roots penetrate below a depth of 15 inches. Available water capacity is high. Permeability is moderate or moderately rapid in the organic material, and moderate in the loamy mineral material. Available nitrogen is high, but it is released slowly because of the high water table. Available phosphorus is high, and available potassium is low. Most areas do not require liming. Excess water and shallow depth of the organic deposits over mineral soils are the principal limitations to use of these soils for farming.

Representative profile of Palms muck, in a meadow in town of Columbia, 90 feet north of Jordanville Road, and 360 feet west of the intersection of Stroupe and Jordanville Roads:

Oa1—0 to 11 inches, black (10YR 2/1) both moist and dry, well-decomposed organic material; weak, coarse, granular structure; very friable; many roots; 10 percent fiber; neutral; gradual, smooth boundary.

Oa2—11 to 17 inches, black (10YR 2/1) both moist and dry, well-decomposed organic material containing some silt; weak, medium, subangular blocky structure; very friable; many roots; less than 5 percent fiber; neutral; abrupt, smooth boundary.

IIC1—17 to 21 inches, very dark gray (N 3/0), gray (N 5/0) dry, heavy silt loam; 30 percent medium, distinct, dark greenish-gray (5BG 4/1) and common, medium, distinct, pale-olive (5Y 6/4) mottles; massive; firm; 5 percent gravel; neutral; gradual, smooth boundary.

IIC2—21 to 50 inches, dark grayish-brown (2.5Y 4/2), grayish-brown (2.5Y 5/2) dry, gravelly silt loam; common, medium, distinct, dark greenish-gray (5BG 4/1) mottles; massive; 30 percent gravel; firm; calcareous; mildly alkaline.

The depth over mineral soil material ranges from 16 to 50 inches. The surficial deposit of organic matter is sapric soil material and is muck to silty or loamy muck. Reaction is slightly acid or neutral. Hues are 10YR, 2.5Y, or N. The organic material has color values of 2 or 3; chroma is 0 to 2. This horizon is structureless (massive) or ranges from weak, granular to subangular blocky in structure. The underlying mineral soil material is fine sandy loam to clay loam. It has color values of 3 to 5; chroma is 0 to 2. Hues are 7.5YR to 5Y. Reaction is neutral or mildly alkaline. Distinct high- and low-chroma mottles are in the mineral soil material. Gravel ranges from 0 to 70 percent.

Palms muck is similar to Carlisle muck but has a thinner organic layer over the mineral soil material. Also, around fringe areas of basins, Palms muck is near Lyons, Ilion, Sun, Allis, and Lamson soils, all of which have less than 15 inches of organic material over mineral soil.

Palms muck (Pk).—This nearly level soil is on depressions, in till plains, lake plains, and low spots on flood plains. Individual areas are irregularly shaped, and range from 3 to 30 acres.

Included with this soil in mapping were small areas of deeper Carlisle muck, and spots of Lyons, Ilion, Sun, and Lamson soils around the fringe areas of depressions where the organic material is less than 15 inches thick.

The greater part of this soil is in marsh vegetation of grasses, reeds and sedges, and water-tolerant tree species. Because of the shallowness of the organic deposits, it is generally not feasible to drain for farming. Capability unit not assigned; woodland suitability group 4w1.

Palmyra Series

The Palmyra series consists of deep, well-drained to excessively drained, medium-textured soils that formed in gravelly glacial outwash derived mainly from limestone that has varying proportions of shale, siltstone, and sandstone, and a few granitic rocks. The soils are nearly level to very steep and are on glacial outwash plains, kames, and kame terraces. They are high in lime.

In a representative profile the surface layer is very dark brown gravelly silt loam about 9 inches thick. It is underlain by a layer of dark-brown, very friable, neutral gravelly very fine sandy loam that is 8 inches thick. Between depths of about 17 and 27 inches, the subsoil is a dark-brown, neutral, friable gravelly silt loam. At a depth of about 27 inches it merges with a calcareous, lower part of the subsoil that is very friable, very dark brown gravelly silt loam about 9 inches thick. The substratum begins at a depth of about 36 inches. It consists of very dark brown, calcareous, stratified gravel and sand that extends to a depth of 60 inches or more.

Normally, the water table in Palmyra soils is several feet deep, but in places it begins at depths of 40 inches. Maximum rooting depth is not restricted, but is mainly 30 inches. Available water capacity is moderate. Permeability is moderate or moderately rapid in the surface layer and subsoil, and rapid or very rapid in the substratum. Available phosphorus, potassium, and nitrogen are generally medium. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Aside from slope and the hazard of erosion, the principal limitations to use of these soils for farming are surface gravel and cobblestones that interfere slightly with precision cultivation, as well as a lack of moisture in places.

Representative profile of Palmyra gravelly silt loam, 3 to 8 percent slopes, in a pasture in town of Winfield, 600 feet south of intersection of Stone and Meeting House Roads, on edge of gravel pit:

Ap—0 to 9 inches, very dark brown (10YR 2/2), gray to light-gray (10YR 6/1) dry, gravelly silt loam; weak, medium, granular structure; very friable; many medium and fine roots; common medium pores; 30 percent gravel; neutral; gradual, smooth boundary.

A&B—9 to 17 inches, dark-brown (10YR 3/3), grayish-brown (10YR 5/2) dry, gravelly very fine sandy loam; weak, medium and fine, subangular blocky structure; very friable; many medium and fine roots; common medium pores; 15 percent darker bodies of gravelly silt loam; 30 percent gravel; neutral; gradual, irregular boundary.

B21t—17 to 27 inches, dark-brown (7.5YR 3/2), light-gray (10YR 6/1) dry, gravelly silt loam; weak, medium and fine, subangular blocky structure; friable; common fine roots; common medium and fine pores; thick clay films on pebbles and in pores; 30 percent gravel and cobblestones; neutral; gradual, wavy boundary.

B3—27 to 36 inches, very dark brown (10YR 2/2), gray to light-gray (10YR 6/1) dry, gravelly silt loam; weak, medium, subangular blocky structure; friable; patchy clay films on pebbles and in pores; few medium pores; 30 percent gravel and cobblestones; calcareous; mildly alkaline.

IIC—36 to 60 inches, very dark brown (10YR 2/2) stratified gravel and sand; calcareous; moderately alkaline.

The solum ranges from 15 to 45 inches in thickness within single profiles due to the tonguing of the B horizon into the C horizon. The depth to carbonates ranges from 20 to 40 inches. Coarse fragments, dominantly gravel and cobblestones, range from 10 to 40 percent, but average less than 35 percent in the solum and from 40 to 60 percent in the IIC horizon.

The Ap horizon ranges from grayish brown (10YR 5/2) to dark brown (7.5YR 3/2) in color. The texture is fine sandy loam to silt loam, and reaction is slightly acid to neutral.

The A&B horizon consists of more than 50 percent A2 material surrounding bodies of finer textured and darker colored B2 material. The A2 material ranges from grayish brown (10YR 5/2) to strong brown (7.5YR 5/6) in color. The texture of the A2 portion of the A&B horizon is silt loam to fine sandy loam, and reaction is slightly acid to neutral. The B material has the same ranges of colors, textures, and reactions as the Bt horizon.

The Bt horizon ranges from very dark brown (10YR 2/2) to reddish brown (5YR 5/4) in color. The texture is friable to firm sandy clay loam to silt loam. This horizon ranges from very weak to moderate, blocky in structure. Reaction is neutral to mildly alkaline.

The IIC horizon ranges from very dark brown (10YR 2/2) to brown (7.5YR 5/4) in color. It is very gravelly loamy sand to stratified sand and gravel that has an abundance of dark-colored shale fragments.

In Herkimer County, many Palmyra soils have darker colors in the subsurface horizons than is defined as the range for the series. This is due to the influence of dark-colored shale, but this difference does not alter the usefulness and behavior of the soils.

Palmyra soils formed in similar material and make up a drainage sequence with the moderately well drained Phelps, the somewhat poorly to poorly drained Fredon, and the very poorly drained Halsey soils. They are also near similar Howard, Herkimer, and Hinckley soils that formed in outwash. Palmyra soils have less than 35 percent gravel in the Bt horizon, in comparison to Howard soils. They have a Bt horizon that is lacking in Herkimer soils, and contain less dark-colored shale. Palmyra soils have a finer textured solum, are less acid, and have a Bt horizon that is lacking in Hinckley soils.

Palmyra gravelly silt loam, 0 to 3 percent slopes (PlA).—This soil is on level to nearly level glacial outwash terraces. Individual areas are irregularly shaped, and range from 5 to 40 acres.

Included with this soil in mapping were small areas of similar but wetter Phelps and Fredon soils in low areas, spots of Herkimer soils adjacent to outwash fans that issue from dark-colored shale uplands, and small areas of Howard soils that have a more gravelly subsoil.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Few limitations to farming exist. Crops respond well to applications of fertilizer according to soil tests. The gravel and cobblestone content of the surface layer interferes with some crops that require precision cultivation. Capability unit I–1; woodland suitability group 2o1.

Palmyra gravelly silt loam, 3 to 8 percent slopes (PlB).—This gently sloping soil is on glacial outwash terraces and kames. Individual areas are irregularly shaped, and range from 5 to 40 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar, but wetter, Phelps and Fredon soils in low spots, small spots of Herkimer soils adjacent to outwash fans that issue from dark-colored shale uplands, and small areas of Howard soils that have a more gravelly subsoil.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight in cultivated areas that are unprotected. Crops respond well to applications of fertilizer according to soil tests. Lack of moisture is slightly limiting in some of the more undulating areas. Capability unit IIe–7; woodland suitability group 2o1.

Palmyra gravelly silt loam, 8 to 15 percent slopes (PlC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that the subsurface layer is thinner in places. It is on glacial outwash terrace breaks that are smoothly sloping. Individual areas are long and narrow, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of similar, but wetter, Phelps soils in lower areas, small spots of Herkimer soils adjacent to outwash fans that issue from dark-colored shale uplands, and small areas of Howard soils that have a more gravelly subsoil.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Runoff is moderate to rapid, and the hazard of erosion is moderate to severe in cultivated areas that are unprotected. This soil is especially well suited to high-yield varieties of alfalfa. Plants will show moisture stress sooner than on less sloping units of Palmyra soils. Capability unit IIIe–2; woodland suitability group 2o1.

Palmyra and Howard soils, rolling (PmC).—The soils in this group have complex, short slopes that are mainly between 5 to 15 percent. Some areas are made up only of Palmyra soils, other areas of only Howard soils, and still others of both soils. Each of these soils has a profile similar to the one described as representative for its respective series except that the surface textures range from gravelly silt loam to gravelly fine sandy loam. The soils are on glacial outwash kames and kame terraces. Individual areas are irregularly shaped, and range from 5 to 30 acres.

Included with this unit in mapping were small areas of similar, but wetter, Phelps and Fredon soils that are mainly in the kettle holes associated with kame topography, spots of Herkimer soils where outwash fans issue from dark-colored shale uplands, and small areas of coarser and more acid Hinckley and Windsor soils.

These soils are poorly suited to farming because of the complex, short slopes; however, they are suited to use for hay, pasture, or trees. The hazard of erosion is moderate, and contour measures to control runoff and erosion are not practical because of the rolling topography. Tillage operations should be largely confined to renovation for hay and pasture. These soils are well suited to high-yield varieties of alfalfa. Droughtiness is limiting in places. Capability unit IVe–2; woodland suitability group 2o1.

Palmyra and Howard soils, 25 to 70 percent slopes (PmF).—The soils in this group are steep to very steep. They are mainly on glacial outwash terrace escarpments. Some areas are made up only of Palmyra soils, other areas of Howard soils, and still others of both soils. Each of these soils has a profile similar to the one described as representative for its respective series except that the surface textures range from gravelly silt loam to gravelly fine sandy loam. Individual areas are mainly long and narrow, and range from 5 to 50 acres.

Included with these soils in mapping were small areas of Herkimer soils where outwash fans issue from dark-colored shale uplands, and spots of more acid and coarser Hinckley and Windsor soils in the towns of Russia and Norway.

Slope limits the use of these soils for crops. Runoff is rapid, the hazard of erosion is severe, and the soils are droughty. These soils provide some early native pasture on the lesser slopes. They are suited to trees. Capability unit VIIe–1; woodland suitability group 2r2.

Phelps Series

The Phelps series consists of deep, moderately well drained, moderately coarse textured soils that formed in gravelly glacial outwash derived mainly from limestone and varying proportions of shale, sandstone, and some granitic rocks. They are nearly level to very gently sloping and are on glacial outwash terraces. They are high in lime.

In a representative profile the surface layer is very dark gray gravelly fine sandy loam about 11 inches thick. Below this is about 7 inches of very dark grayish-brown, neutral, very friable gravelly loamy fine sand. Between depths of about 18 and 28 inches, the subsoil is mottled, very dark grayish-brown gravelly fine sandy loam that is friable and neutral. At a depth of about 28 inches, it merges with a very friable substratum that is mottled, very dark grayish-brown, neutral very gravelly loamy sand to a depth of about 36 inches. Below this, to a depth of 50 or more inches, the substratum is very dark grayish-brown, calcareous gravelly fine sand.

In spring and during wet periods, Phelps soils have a seasonal high water table that fluctuates to within 18 to 24 inches of the surface. Permeability ranges from moderate to rapid in the different layers in the profile. Maximum rooting depth is mainly 20 inches early in the season. Few roots extend below this as the water table recedes. Available water capacity is low, but normally there is enough recharge during the growing season to provide sufficient water for plant growth. Available phosphorus is generally medium to low, and available potassium and nitrogen are medium. Reaction in the surface layer is slightly acid to neutral in unlimed areas. A slight seasonal wetness is the principal limitation to use of these soils for farming.

Representative profile of Phelps gravelly fine sandy loam, 0 to 4 percent slopes, in a cultivated field in town of Manheim, 40 feet north of Saltsman Road, and 0.05 mile east of the intersection of Saltsman and East Creek Roads:

Ap—0 to 11 inches, very dark gray (10YR 3/1), dark-gray (10YR 4/1) dry, gravelly fine sandy loam; weak, medium, subangular blocky structure; friable; few medium and fine roots; few medium pores; few, washed sand grains; slightly compacted from excessive tillage; 25 percent gravel; neutral; abrupt, smooth boundary.

IIA&B—11 to 18 inches, very dark grayish-brown (10YR 3/2), dark grayish-brown (10YR 4/2) dry, gravelly loamy fine sand; weak, medium, subangular blocky structure; very friable; few medium and fine roots; common medium pores; few, scattered clay films on pebbles and in pores; 30 percent gravel; horizon consists of A2 interfingering into B21t; neutral; gradual, wavy boundary.

IIB2t—18 to 28 inches, very dark grayish-brown (10YR 3/2), dark grayish-brown (10YR 4/2) dry, gravelly fine sandy loam; common, medium, faint brown to dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; few fine roots; common medium pores; scattered clay films on pebbles and in pores; 30 percent gravel; neutral; gradual, wavy boundary.

IIIC1—28 to 36 inches, very dark grayish-brown (10YR 3/2), dark grayish-brown (10YR 4/2) dry, very gravelly loamy sand; common, medium, distinct, brown to dark-brown (7.5YR 4/4) mottles; single grain; very friable; 60 percent gravel and shale fragments; neutral; gradual, wavy boundary.

IVC2—36 to 50 inches, very dark grayish-brown (10YR 3/2), grayish-brown (10YR 5/2) dry, gravelly fine sand; single grain; very friable; 30 percent gravel and shale fragments; calcareous, moderately alkaline.

The solum ranges from 24 to 36 inches in thickness. The depth to free carbonates ranges from 18 to 40 inches. Coarse fragments range from 15 to 35 percent in the solum and 35 to 70 percent in the substratum. Hues range from 7.5YR to 2.5Y, but 10YR hues predominate.

The Ap horizon has color values of 3 or 4; chroma is 1 to 3. The A2 horizon has been mixed with the Ap horizon in many profiles, but where it remains it has color values one or two units higher than the underlying B horizon. The A2 horizon, where present, interfingers into the B horizon, and in many areas forms an A&B horizon.

The B2t horizon has color values of 3 to 5; chroma is 2 or 3. Most of the mottles in the B horizon have higher chromas than the matrix. The B horizon is gravelly silt loam to gravelly fine sandy loam. Clay films are present on many of the gravel grains and in some of the pores.

Color of the C horizon is about the same as for the B horizon. The C horizon is coarser textured than the B horizon, and contains more coarse fragments. Most profiles of Phelps soils have contrasting soil material in the form of layers of silt, sand, and gravel below a depth of 40 inches.

Most Phelps soils in Herkimer County have B horizons that are coarser in texture than is defined as the range for the series. Also, color values and chroma are generally lower due to the influence of dark-colored shale in the regolith. The available water capacity is lower than normal for the series, but otherwise these differences do not alter the usefulness and behavior of the soils.

Phelps soils formed in similar material and are in a drainage sequence with the well-drained to excessively drained Palmyra soils, the well-drained to somewhat excessively drained Howard soils, the somewhat poorly to poorly drained Fredon soils, and the very poorly drained Halsey soils.

Phelps gravelly fine sandy loam, 0 to 4 percent slopes (PpB).—This nearly level to very gently sloping soil is on low or slightly depressed areas of glacial outwash terraces where runoff or internal drainage is somewhat slow. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but wetter Fredon and Halsey soils in lower areas and along drainageways, spots of drier Howard and Palmyra soils on knolls, and small areas that have gravelly silt loam and gravelly loam surface layers.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Slight wetness in places delays planting briefly in spring. Random drainage of included wetter soils is desirable in places. Capability unit IIw-1; woodland suitability group 2o1.

Raynham Series

The Raynham series consists of deep, poorly drained to somewhat poorly drained, medium-textured soils that formed in water-laid deposits of silt and very fine sand. These soils are nearly level to very gently sloping and are on lake plains. They are medium in lime.

In a representative profile the surface layer is dark-brown silt loam about 9 inches thick. The subsoil is about 36 inches thick. In sequence from the top, the upper 8 inches is mottled, dark grayish-brown, slightly acid, friable silt loam. The next 8 inches is mottled, dark grayish-brown, neutral, firm silt loam. The next 9 inches is mottled, brown to dark-brown, neutral, friable silt loam. The lower 11 inches is gray and yellowish-brown, friable, neutral silt loam. The calcareous substratum begins at a depth of about 45 inches. It consists of mottled, gray, friable silt loam that extends to a depth of 56 inches or more.

In spring and during wet periods, Raynham soils have a seasonal high water table within 6 to 18 inches of the surface for extended periods. This water table is perched on slowly permeable layers in the subsoil or substratum. Maximum rooting depth is influenced by the water table, and is mainly 10 to 15 inches early in the season. Few roots extend below this depth as the water table recedes. Available water capacity is high. Available phosphorus is generally low, and available potassium is medium to low. Available nitrogen is high, but it is released slowly when the soils are wet and cold, and plants show response to nitrogen fertilization according to soil tests. Reaction in the surface layer is medium to slightly acid in unlimed areas. Excess water is the principal limitation to use of these soils for farming.

Representative profile of Raynham silt loam, 0 to 4 percent slopes, in a hayfield in town of Manheim, 0.35 mile northeast of the right-angled turn in Burrell Road:

Ap—0 to 9 inches, dark-brown (10YR 3/3), pale-brown (10YR 6/3) dry, silt loam; weak, medium and coarse, granular structure; friable; many medium and fine roots; common medium and coarse pores; slightly acid; abrupt, smooth boundary.

B21—9 to 17 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, faint yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; scattered fine roots; common medium and coarse pores; few, washed sand grains; slightly acid; gradual, wavy boundary.

B22—17 to 25 inches, dark grayish-brown (10YR 4/2) silt loam; many, coarse, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few fine roots; common medium and fine pores; neutral; gradual, wavy boundary.

B23—25 to 34 inches, brown to dark-brown (10YR 4/3) silt loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, and coarse, angular blocky structure; friable; few fine roots; common medium pores; neutral; gradual, wavy boundary.

B24—34 to 45 inches, 50 percent gray (10YR 5/1), 50 percent yellowish-brown (10YR 5/6) silt loam; moderate, coarse, subangular blocky structure; friable; few, scattered, black shale chips below depth of 40 inches; neutral; gradual, wavy boundary.

C—45 to 56 inches, gray (10YR 5/1) silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; few, scattered shale chips; neutral.

The solum ranges from 30 to 45 inches in thickness. Reaction is medium acid to neutral. The solum is silt loam to very fine sandy loam. Coarse fragments in the form of pebbles are absent or few. The Ap or A1 horizons are brown (7.5YR 4/2) to dark brown (10YR 3/3) in color. Reaction depends on past liming. The B horizons have hues of 10YR or 2.5Y, and values of 4 through 6; chroma is 1 or 2. High-chroma mottles commonly are immediately below the Ap horizon and in the underlying horizons. The B horizons are firm or friable. The C horizon ranges from gray (10YR 5/1) to olive (5Y 4/3) in color, and has distinct yellowish-brown (10YR 5/6) to olive-brown (2.5Y 4/4) mottles. It is silt loam to stratified very fine sand and silt.

Raynham soils are closely associated geographically with Williamson, Lamson, Rhinebeck, and Wayland soils. They are wetter and lack the fragipan of Williamson soils, and are slightly better drained and contain more silt than Lamson soils. Raynham soils have coarser textured B horizons than somewhat poorly drained Rhinebeck and poorly to very poorly drained Wayland soils.

Raynham silt loam, 0 to 4 percent slopes (RaB).—This nearly level to very gently sloping soil is on low areas or depressions of lake plains where runoff is slow or or water accumulates. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of drier Williamson soils on slight rises and wetter Lamson soils in lower positions, areas of Rhinebeck soils that have a finer textured subsoil, a few small areas where the lower part of the subsoil is a fragipan, and, along waterways, spots of Wayland soils that are subject to flooding.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, planting is delayed and the choice of crops restricted. This soil should be limed and fertilized according to soil tests. Capability unit IIIw–1; woodland suitability group 4w1.

Rhinebeck Series

The Rhinebeck series consists of deep, somewhat poorly drained, medium-textured soils that have a moderately fine to fine textured subsoil. These soils formed in clayey lacustrine sediments 40 to 60 inches thick over glacial till, glacial outwash, or bedrock. They are nearly level to gently sloping and are mainly along fringe areas of old lake plains. Rhinebeck soils are medium to high in lime.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. It is underlain by a leached subsurface layer of mottled, yellowish-brown, medium acid, friable silt loam about 5 inches thick. The subsoil begins at a depth of 12 inches. In the upper part, between depths of 12 and 16 inches, it consists of mottled, brown, firm, medium acid heavy silty clay loam. Between depths of about 16 and 33 inches, the subsoil is mottled, dark grayish-brown, firm, neutral silty clay. At a depth of about 33 inches, the upper part of the substratum is mottled, dark grayish-brown, calcareous, firm silty clay loam. From a depth of about 50 inches to a depth of 60 or more inches, the substratum is mottled, dark-brown gravelly silt loam till that is firm and calcareous.

In spring and during wet periods, Rhinebeck soils have a seasonal high water table within 6 to 18 inches of the surface. This water table is perched on the slowly permeable subsoil. Permeability can range from slow to rapid in the substratum, depending on the nature of the material. Maximum rooting depth is influenced by the water table and is mainly 10 to 15 inches. Few roots extend below this depth. Available water capacity in the rooting zone is moderate, but generally more than enough moisture is available for plant growth. Available phosphorus is generally medium, and available potassium is high. Available nitrogen is high, but it is released slowly when the soils are wet and cold. Reaction in the surface layer is medium acid to neutral in unlimed areas. Excess water and the difficulty of maintaining good tilth are the principal limitations to use of these soils for farming.

Representative profile of Rhinebeck silt loam, loamy substratum, 3 to 8 percent slopes, in a pasture in town of Manheim, 120 feet west of Timmerman Road, and 0.2 mile north of the junction of Timmerman Road and New York State Highway 5:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2), light-gray (2.5Y 7/2) dry, silt loam; weak, coarse, granular structure; very friable; many fine roots; common medium and fine pores; medium acid; abrupt, smooth boundary.

A2—7 to 12 inches, yellowish-brown (10YR 5/4) heavy silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common fine roots; many medium pores; medium acid; gradual, wavy boundary.

B21t—12 to 16 inches, heavy silty clay loam that has brown (10YR 5/3) ped interiors; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; firm; few fine roots; common medium pores that have a thick clay lining; thin, grayish-brown (10YR 5/2) silt coats on surface of peds in this horizon's upper 2 inches, and patchy clay films in lower 2 inches; medium acid; gradual, smooth boundary.

B22t—16 to 33 inches, silty clay that has dark-gray (10YR 4/1) ped surfaces; dark grayish-brown (10YR 4/2) ped interiors; common, medium, distinct, brown to dark brown (7.5YR 4/4) mottles; moderate, coarse, angular blocky structure; firm; few fine roots; common medium pores; continuous clay films on ped surfaces and in pores; neutral; gradual, smooth boundary.

C1—33 to 50 inches, silty clay loam that has dark-gray (10YR 4/1) ped surfaces; dark grayish-brown (10YR 4/2) ped interiors; 30 percent medium, distinct, brownish-yellow (10YR 6/6) mottles; moderate, coarse, angular blocky structure; firm; common medium pores; clay films in pores; calcareous, mildly alkaline; abrupt, wavy boundary.

IIC2—50 to 60 inches, dark-brown (10YR 3/3), gravelly silt loam. It has color values of 4 to 6; chroma is 2 to 4. The A2 (10YR 5/6) mottles; massive; firm; 30 percent shale chips and gravel; calcareous, moderately alkaline.

The solum ranges from 20 to 48 inches in thickness. Reaction is medium acid to neutral. The substratum is calcareous. Hue ranges from 7.5YR to 2.5Y.

The A horizon, when moist, has color values of 3 to 5; chroma is 2 to 4. The A2 horizon is silt loam to silty clay loam. It has color values of 4 to 6; chroma is 2 to 4. The A2 and B horizons are highly mottled.

Texture of the B2t horizon is clay, silty clay, or heavy silty clay loam. Chroma of the upper B horizon is more than 2 in the ped interiors, but 2 or less on ped surfaces. In the lower part of the B horizon, chroma is 2 or less on ped surfaces and in ped interiors. The B horizon has color values of 3 to 5.

The C horizon is silty clay loam to clay, with thin varves of sand and silt in some profiles. It has color values of 3 to 5; chroma is 1 to 3. Hue is 10YR. The IIC horizon is coarser in texture and has gravel, cobblestones, and shale chips scattered throughout. Contrasting textures are common to the Rhinebeck soils in Herkimer County at depths of 40 to 60 inches.

Rhinebeck soils formed in similar material and make up a drainage sequence with the moderately well drained Hudson soils. They are also near Ilion, Raynham, and Burdett soils. Rhinebeck soils have finer textured Bt horizons and are drier than the poorly drained Ilion soils. They have finer textured Bt horizons than either Raynham or Burdett soils. Also, they have a Bt horizon that is lacking in Raynham soils.

Rhinebeck silt loam, loamy substratum, 0 to 3 percent slopes (RbA).—This level to nearly level soil has a profile similar to the one described as representative for the series except that the surface layer is generally a little darker in color. It commonly is on fringe areas of old lake plains where glacial till, glacial outwash, or bedrock is at depths of 40 to 60 inches. Runoff is slow and water accumulates to some degree. Individual areas are irregularly shaped, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of similar but better drained Hudson soils on knolls and wetter Ilion soils in depressions, spots of Burdett soils that formed partly in underlying till, and small areas that are at depths of less than 40 or more than 60 inches over underlying till, outwash, or bedrock.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, planting is delayed and the choice of crops restricted. Good tilth is difficult to maintain. This soil clods and puddles easily if tilled at the wrong moisture content. Capability unit IIIw-2; woodland suitability group 3w1.

Rhinebeck silt loam, loamy substratum, 3 to 8 percent slopes (RbB).—This gently sloping soil is on fringe areas of old lake plains where glacial till, glacial outwash, or bedrock is at depths of 40 to 60 inches. It is generally on foot slopes where runoff is received from higher lying soils, and water accumulates to some degree. Individual areas are irregularly shaped, and range from 5 to 30 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but better drained Hudson soils on higher positions in the landscape, spots of wetter Ilion soils in low areas and along drainageways, small areas of Burdett soils that formed partly in underlying till, and small areas that are at depths of less than 40 or more than 60 inches over underlying till, outwash, or bedrock.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Unless drained, planting is delayed and the choice of crops restricted. A hazard of erosion exists in cultivated areas that are unprotected. Good tilth is difficult to maintain. This soil clods and puddles easily if tilled at the wrong moisture content. Capability unit IIIw-4; woodland suitability group 3w1.

Rough Broken Land

Rough broken land (Ro) consists of very steep land that is dissected by numerous intermittent drainage channels. The dissections are mainly in deep glacial till along valley sides and, to a lesser degree, through glacial outwash and lacustrine deposits. In places small areas of Shaly rock land, very steep, were included with this land type in mapping. Runoff is very rapid and geological erosion is active.

This land type is too steep to be used for farming. Most areas are covered with trees and brush, and a few areas have grass vegetation that provides some low-quality pasture. In places this land type has potential for some recreational uses. Capability unit and woodland suitability group not assigned.

Sandstone Rock Land

Sandstone rock land (Sa) consists of areas having enough sandstone rock outcrop and very shallow soil over sandstone to override other soil characteristics. About 25 to 90 percent of these areas consists of exposed bedrock. This land type is nearly level to very steep. Included with this land type in mapping were a few spots where the bedrock is granite rather than sandstone.

This land type is not suited to farming. Vegetation is sparse. In places the land type has potential for some recreational uses and is a source of sandstone for crushing. Capability unit and woodland suitability group not assigned.

Shaly Rock Land, Very Steep

Shaly rock land, very steep (ShF), consists of very steep areas having enough shale rock outcrop or very shallow soil over shale to override other soil characteristics. About 25 to 90 percent of these areas consists of exposed shale bedrock. Included with this land type in mapping were small areas that have a deeper soil mantle over shale and have been deeply dissected by intermittent drainage channels, which exposed the shale. Also included were spots of the land type Rough broken land, where the shale bedrock was not exposed by the dissection.

This land type is not suited to farming. Most areas that are not exposed bedrock have a cover of brush and trees. Runoff is very rapid, and geologic erosion is active. In places this land type has potential for some recreational uses. It is a source of shale for fill. Capability unit and woodland suitability group not assigned.

Sun Series

The Sun series consists of deep, very poorly drained to poorly drained, medium-textured soils that formed in loamy glacial till from sandstone and limestone or granitic rocks and limestone. In many places the upper soil layers formed in local alluvium. These soils are nearly level or are in depressions on upland till plains where water accumulates. They are medium to high in lime.

In a representative profile the surface layer is black mucky silt loam 8 inches thick that contains some gravel. Between depths of 8 and 25 inches is a firm, neutral subsoil of mottled, dark grayish-brown very fine sandy loam that contains about 10 percent gravel. At a depth of about 25 inches, the upper part of the substratum is mottled, gray to light-gray fine sandy loam about 7 inches thick that contains about 10 percent gravel and is neutral. Below a depth of about 32 inches, the substratum is mottled, dark-gray, firm, gravelly loam till that is calcareous and extends to a depth of 50 inches or more.

Sun soils have a prolonged high water table that is at or near the surface during much of the year. This water table is perched on the moderately slowly or slowly permeable substratum. Maximum rooting depth is determined by the water table. Few roots penetrate below a depth of 15 inches, unless the soils are drained. Available water capacity in the rooting zone is low, but normally more than enough water is available for plant growth. Available phosphorus is generally low, and available potassium is medium. Available nitrogen is high, but it is released slowly when the soils are wet and cold. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Excess water is one of the principal limitations to use of these soils for farming.

Representative profile of Sun mucky silt loam, in a meadow in town of Russia, 90 feet south of Russia Road, and 200 feet west of the intersection of Russia and Grant Roads:

A1—0 to 8 inches, black (10YR 2/1), dark-gray (10YR 4/1) dry, mucky silt loam; weak, medium and fine, granular structure; very friable; many fine and coarse roots; 5 percent gravel; neutral; gradual, wavy boundary.

B2g—8 to 25 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; many, medium, distinct, strong-brown (7.5YR 5/6) and common, medium, faint, grayish-brown (10YR 5/2) mottles; moderate, medium and coarse, angular blocky structure; firm; many partly decayed coarse roots; 10 percent gravel; neutral; gradual, wavy boundary.

C1g—25 to 32 inches, gray to light-gray, (10YR 6/1) fine sandy loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; 10 percent gravel and black (10YR 2/1) shale chips; neutral; gradual, wavy boundary.

IIC2g—32 to 50 inches, dark-gray (5Y 4/1) gravelly loam; common, medium, faint, olive (5Y 5/3) mottles; massive; firm; 25 percent gravel; neutral.

The solum ranges from 20 to 40 inches in thickness. The depth to free carbonates ranges from 20 to 70 inches. Coarse fragments, including stone-sized fragments, range from 0 to 35 percent in the upper part of the profile and from 20 to 50 percent below depths of 40 inches. Hue ranges from 10YR to 5Y.

The Ap or A1 horizons are black (10YR 2/1) to dark brown (7.5YR 3/2) in color and are silt loam to very fine sandy loam. In many profiles the soil has a mucky surface layer. Reaction is slightly acid to neutral.

The B2 horizon is dark grayish-brown (10YR 4/2) to olive brown (2.5Y 4/4) in color. It is friable or firm loam to sandy loam. Reaction is slightly acid to neutral. Distinct high- and low-chroma mottles are in the B horizon.

The C horizon is loam to sandy loam that is dark gray (5Y 4/1) to light gray (10YR 6/1) in color. High-chroma mottles are in the C horizon. It is neutral, mildly alkaline, or calcareous.

Sun soils formed in similar material and make up a drainage sequence with the moderately well drained Bombay and the somewhat poorly to poorly drained Massena soils. They are also near Ilion, Lamson, Cohoctah, and Canton soils. Sun soils contain less clay and lack the Bt horizon of Ilion soils. They contain more coarse fragments than Lamson and Cohoctah soils. In Herkimer County, Sun soils are the very poorly to poorly drained associate of the well-drained Canton soils.

Sun mucky silt loam (Sm).—This level or nearly level soil is in low areas and depressions on upland till plains where runoff is slow or runoff water accumulates. Individual areas are irregularly shaped, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but better drained Mosherville and Massena soils on slight rises and knolls, spots of less gravelly Lamson soils, mainly in the towns of Salisbury and Norway, a few small areas of very stony Sun soils, and, along waterways, spots of Cohoctah soils that are subject to flooding.

Unless drained, this soil is not suited to farming, but will provide some wild pasture, and is suited to tree species that tolerate wetness. With adequate drainage it is suited to most crops grown in the area. Drainage outlets are often difficult to locate. Capability unit IVw-1; woodland suitability group 4w1.

Teel Series

The Teel series consists of deep, moderately well drained to somewhat poorly drained, medium-textured and moderately coarse textured soils that formed in loamy alluvium derived mainly from areas of limestone and some shale, sandstone, and granite. They are level or nearly level and are on flood plains. Teel soils are medium to high in lime.

In a representative profile the surface layer is very dark grayish-brown silt loam about 11 inches thick. The subsoil is friable, neutral silt loam that is very dark grayish brown to a depth of about 20 inches. Below this it is mottled, very dark gray. The substratum begins at a depth of about 30 inches. It consists of firm, neutral silt loam that is mottled dark gray to a depth of about 50 inches, and mottled yellowish brown below this to a depth of 55 or more inches.

Teel soils are subject to occasional flooding, and have a fluctuating water table that persists at depths of 12 to 24 inches for extended periods. Permeability is moderate throughout the profile, and the depth to the water table is determined by the water levels of adjacent streams. Maximum rooting depth is influenced by the water table, and is mainly 20 inches. Few roots extend below this depth as the water table recedes. Available water capacity is high. Available phosphorus is generally medium, available potassium is medium to low, and available nitrogen is medium to high. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Slight wetness and the hazard of occasional flooding are the principal limitations to use of these soils for farming.

Representative profile of Teel silt loam, in a pasture in town of Little Falls, 0.25 mile south of New York State Highway 5, and 0.75 mile west of the intersection of New York State Highway 5 and Gun Club Road:

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2), gray to light-gray (10YR 6/1) dry, silt loam; weak, medium and coarse, granular structure; friable; many fine roots; common medium pores; neutral; abrupt, smooth boundary.

B21—11 to 20 inches, very dark grayish-brown (10YR 3/2), light brownish-gray (10YR 6/2) dry, silt loam; weak, medium, subangular blocky structure; friable; common fine roots; common medium and fine pores; few dark yellowish-brown (10YR 4/4) stains around decayed roots; neutral; gradual, smooth boundary.

B22—20 to 30 inches, very dark gray (10YR 3/1), gray to light-gray (10YR 6/1) dry, silt loam; many, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, coarse, subangular blocky structure; friable; few fine roots; common medium and fine pores; neutral; gradual, smooth boundary.

C1—30 to 50 inches, dark-gray (10YR 4/1) silt loam; common, coarse, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; few scattered roots; few medium pores; neutral; gradual, smooth boundary.

C2—50 to 55 inches, yellowish-brown (10YR 5/4) silt loam; common, coarse, distinct, dark-gray (N 4/) mottles; massive; firm; neutral.

The solum ranges from 24 to 40 inches in thickness. The depth to bedrock is more than 40 inches. The solum is slightly acid or neutral in the upper part, and neutral or mildly alkaline in the lower part. Free carbonates do not occur above depths of 40 inches. Hue in the solum and substratum ranges from 10YR to 5Y.

The Ap or A1 horizon is friable to very friable fine sandy loam to silt loam. It has color values of 2 to 4 when moist, and above 5.5 when dry; chroma is 2 or 3. This horizon ranges from weak, medium and coarse, granular to weak, medium and fine, subangular blocky in structure.

The friable B horizon is fine sandy loam to silt loam. It has color values of 3 or 4; chroma is 1 to 3. This horizon is weak or moderate, medium or coarse, angular or subangular blocky in structure. The lower B horizon has distinct high- or low-chroma mottles, depending on the chroma of the matrix.

The C horizon is fine sandy loam to silt loam. It has color values of 3 to 5; chroma is 1 to 4. This horizon has medium or coarse, distinct or prominent mottles with either high or low chromas.

Teel soils formed in similar material on flood plains and make up a drainage sequence with the well-drained Hamlin soils and the poorly to very poorly drained Cohoctah soils. They are also near Wayland and Phelps soils. Teel soils contain less clay and are better drained than the poorly to very poorly drained Wayland soils, which are also on flood plains. They lack the gravel content and Bt horizon of Phelps soils, which are on outwash terraces and fans rather than flood plains.

Teel fine sandy loam (Te).—This level or nearly level soil has a profile similar to the one described as representative for the series except that it is coarser in texture throughout the profile. Most areas are in tributary valleys that drain into the Mohawk River. This soil is on flood plains where water tables are high part of the year. Individual areas are long and narrow along streams, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of similar but better drained Hamlin soils on slight rises and knolls, spots of wetter Cohoctah and Wayland soils in depressions, and spots of gravelly Phelps soils on higher landscapes that are not subject to flooding.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Slight to moderate wetness in places delays planting briefly. This soil is subject to occasional flooding, which generally occurs in the spring. Potassium reserves and available water capacity are lower than in Teel silt loam. In places, measures to control streambank erosion are desirable. Capability unit IIw–2; woodland suitability group 2o1.

Teel silt loam (Ts).—This level or nearly level soil is on flood plains where water tables are high part of the year. Most areas are along the Mohawk Valley. Individual areas are long and narrow, and range from 5 to 20 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but better drained Hamlin soils on slight rises and knolls, spots of wetter Wayland and Cohoctah soils, and a few small areas of gravelly Phelps soils on outwash fans that are not subject to flooding.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Slight to moderate wetness in places delays planting briefly. This soil is subject to occasional flooding, which generally occurs in the spring. In places, measures to control streambank erosion are desirable. Capability unit IIw–2; woodland suitability group 2o1.

Wassaic Series

The Wassaic series consists of moderately deep, well-drained, medium-textured soils that formed in thin glacial till derived mainly from limestone that has varying proportions of sandstone and shale and some granitics. These soils are nearly level to moderately steep and on glacially modified, bedrock-controlled till plains. Wassaic soils are medium to high in lime.

In a representative profile the surface layer is black silt loam, 2 inches thick, that contains a trace of gravel, and is overlain by a layer of partly decomposed forest litter that is ½ inch thick. It is underlain by a leached subsurface layer, about 5 inches thick, of brown to dark-brown friable loam that contains some gravel and is medium acid. This layer interfingers into the upper part of the subsoil at a depth of about 7 inches. The subsoil consists of brown to dark-brown, medium acid, friable gravelly silt loam. It extends to a depth of 28 inches where it is underlain by hard limestone bedrock.

The water table in Wassaic soils is normally at depths of several feet. In places it begins at a depth of 42 inches. Maximum rooting depth is determined by the depth to bedrock, which is 20 to 40 inches. Permeability of the soil profile above the rock is moderate. Available water capacity is moderate. Available phosphorus is generally medium to low, available potassium is medium to high, and available nitrogen is generally medium. Reaction in the surface layer is medium acid to neutral in unlimed areas. Aside from the slope and the hazard of erosion, spotty moisture conditions caused by varying depths to bedrock are some of the principal limitations to use of these soils for farming.

Representative profile of Wassaic silt loam, 0 to 3 percent slopes, in a forest in town of Warren, ⅝ mile north of Hicks Road, 200 feet east of Radek Road:

O2—½ inch to 0, black (10YR 2/1) crushed and uncrushed, partly decomposed forest litter; clear, smooth boundary.

A1—0 to 2 inches, black (10YR 2/1) crushed and uncrushed, light silt loam; weak, fine, granular structure; friable; many fine roots; scattered, washed sand grains; 5 percent gravel; medium acid; gradual, wavy boundary.

A2—2 to 7 inches, brown to dark-brown (7.5YR 4/4) loam; weak, medium and fine, subangular blocky structure; friable; many medium and fine and few coarse roots; 5 percent gravel; medium acid; gradual, irregular boundary with interfingers of the A2 into the B21t.

B&A—7 to 16 inches, brown to dark-brown (10YR 4/3) gravelly silt loam; weak, medium and fine, subangular blocky structure; friable; many fine roots; common medium and fine pores; thin, patchy clay films on ped faces and in pores; brown to dark-brown (7.5YR 5/2) silt coats on ped faces in upper 4 inches; 25 percent gravel and stones; medium acid; gradual, wavy boundary.

B2t—16 to 28 inches, dark-brown (10YR 3/3) gravelly silt loam; moderate, medium, subangular blocky structure; friable; common fine roots; common medium and fine pores; thin, patchy clay films on ped surfaces and in pores; 25 percent gravel and stones; medium acid; abrupt, wavy boundary.

R—28 inches +, limestone bedrock.

The solum ranges from 20 to 36 inches in thickness. The depth to bedrock ranges from 20 to 40 inches. Coarse fragments include nonstony and stony classes of surface soil, and range from gravelly to stony or bouldery in the substratum.

The Ap or A1 horizon ranges from dark brown (7.5YR 4/2) to black (10YR 2/1) in color. Reaction is medium acid to neutral. The A2 horizon ranges from brown (7.5YR 5/4) to dark grayish brown (10YR 4/2) in color. It is loam to very fine sandy loam that ranges from weak, subangular blocky to weak, platy in structure. Reaction is medium acid to neutral.

The B2t horizon ranges from brown (7.5YR 4/4) to dark grayish brown (2.5Y 4/2) in color. It ranges from subangular blocky to blocky in structure, and has clay films on the ped surfaces and in pores. Reaction is medium acid to mildly alkaline, and the mildly alkaline horizons are next to limestone bedrock.

The C horizon, where present, is gravelly to stony fine sandy loam to silt loam that has the same color range as the B2t horizon. Reaction is slightly acid to mildly alkaline.

Wassaic soils are associated with Honeoye, Lansing, Mohawk, and Manheim soils, all of which are deeper than 40 inches to bedrock. They are also near Farmington soils that are less than 20 inches to bedrock.

Wassaic silt loam, 0 to 3 percent slopes (WaA).—This level to nearly level soil is on glacially modified, bedrock-controlled till plains. Individual areas are irregularly shaped and range from 5 to 50 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of similar but deeper Honeoye and Lansing soils, spots of shallower Farmington soils, a few spots that are coarser in texture, and spots that are more acid and underlain by sandstone bedrock rather than limestone. A few small areas of Mohawk and wetter Manheim soils that are rich in dark-colored shale and moderately shallow over limestone were included, mainly in the towns of Manheim and Fairfield.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Shallower areas are droughty. Other than this, few limitations to farming this soil exist. Capability unit IIs–2; woodland suitability group 2o1.

Wassaic silt loam, 3 to 8 percent slopes (WaB).—This gently sloping soil has a profile similar to the one described as representative for the series except that depth to bedrock is more erratic from place to place. It is on glacially modified, bedrock-controlled till plains. Individual areas are irregularly shaped, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of similar but deeper Honeoye and Lansing soils, spots of shallower Farmington soils, a few spots that are coarser in texture, and spots that are more acid and underlain by sandstone bedrock rather than limestone. In the towns of Manheim and Fairfield, a few small areas of Mohawk and wetter Manheim soils that are rich in dark-colored shale and moderately shallow over limestone were included.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is slight to moderate in cultivated areas that are unprotected. Also, shallower areas are droughty. Capability unit IIe–1; woodland suitability group 2o1.

Wassaic silt loam, 8 to 15 percent slopes (WaC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that depth to bedrock is more erratic from place to place and a few limestone outcrops are present. It is on glacially modified, bedrock-controlled till plains. Individual areas are long and narrow on breaks, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of similar but deeper Honeoye and Lansing soils, spots of shallower Farmington soils, a few spots that are coarser in texture, and spots that are more acid and underlain by sandstone bedrock rather than limestone. In the towns of Manheim and Fairfield, there were a few small areas of Mohawk soils included that are rich in dark-colored shale and moderately shallow over limestone.

This soil is suited to most crops grown in the county, and to hay, pasture, or trees. The hazard of erosion is moderate to severe in cultivated areas that are unprotected. The available water capacity is spotty from place to place, because of the varying depths to bedrock. The shallower areas are droughty. Also, a few rock outcrops interfere with tillage operations. Capability unit IIIe–1; woodland suitability group 2o1.

Wassaic silt loam, 15 to 25 percent slopes (WaD).—This moderately steep soil has a profile similar to the one described as representative for the series except that depth to bedrock is very erratic from place to place and quite a few limestone outcrops are present. It is on glacially modified, bedrock-controlled till plains. Individual areas are long and narrow on breaks, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of similar but deeper Honeoye and Lansing soils, spots of shallower Farmington soils, a few spots that are coarser in texture, and spots that are more acid and underlain by sandstone bedrock rather than limestone. Included in the towns of Manheim and Fairfield were a few small areas of Mohawk soils that are rich in dark-colored shale and moderately shallow over limestone.

This soil is poorly suited to farming, but is suited to hay, pasture, or trees. The moderately steep slopes are difficult and hazardous to work with machinery. Runoff is rapid and the hazard of erosion is severe in cultivated areas that are unprotected. The available water capacity is very spotty from place to place, because of the varying depths to bedrock. The shallower areas are droughty. Also, quite a few rock outcrops that interfere with tillage operations are present. Capability unit IVe–1; woodland suitability group 2r1.

Wayland Series

The Wayland series consists of deep, poorly drained and very poorly drained, medium-textured soils that formed in alluvium washed from uplands containing some calcareous material. These soils are level or nearly level and are on flood plains where the water tables are at or near the surface much of the time. They are medium to high in lime.

In a representative profile the surface layer is silt loam that is very dark brown in the upper 7 inches and mottled, very dark grayish brown in the lower 5 inches. Between depths of 12 and 17 inches, the upper part of the subsoil is mottled, dark-gray, slightly acid, friable silt loam. Below a depth of 17 inches, the subsoil is mottled, dark-gray, firm, slightly acid silty clay loam. The neutral substratum begins at a depth of 28 inches. It consists of very dark gray and yellowish-brown, very friable gravelly silt loam to a depth of 33 inches. Between depths of 33 and 51 or more inches, the substratum is mottled, dark-gray, firm silty clay loam.

Wayland soils are subject to flooding, and have a water table at or near the surface for prolonged periods. The water table is determined largely by the water levels of adjacent streams. Maximum rooting depth is influenced by the water table, and is mainly 10 to 15 inches unless the soils are drained. Available water capacity in the rooting zone is moderate, but normally more than enough water is available for plant growth. Available phosphorus and potassium are generally medium. Available nitrogen is high, but it is released slowly during wet periods. Reaction in the surface layer is slightly acid to neutral in unlimed areas. Excess water and flooding are the principal limitations to use of these soils for farming.

Representative profile of Wayland silt loam, in a pasture in town of Schuyler, 165 feet south of Dyke Road, 0.2 mile west of intersection of Dyke Road and New York State Highway 5:

A11—0 to 7 inches, very dark brown (10YR 2/2), gray to light-gray (10YR 6/1) dry, silt loam; weak, fine, granular structure; very friable; many medium and fine roots; few medium pores; slightly acid; gradual, smooth boundary.

A12—7 to 12 inches, very dark grayish-brown (10YR 3/2), gray to light-gray (10YR 6/1) dry, silt loam; few, fine, faint, strong-brown (7.5YR 5/6) mottles; weak, medium and fine, subangular blocky structure; friable; common fine roots; common medium pores; slightly acid; gradual, wavy boundary.

B21—12 to 17 inches, dark-gray (10YR 4/1) heavy silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few fine roots; common medium and fine pores; slightly acid; gradual, wavy boundary.

B22—17 to 28 inches, dark-gray (10YR 4/1) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, angular blocky structure; firm; few fine pores; slightly acid; gradual, wavy boundary.

IIC1—28 to 33 inches, 50 percent very dark gray (10YR 3/1), 50 percent yellowish-brown (10YR 5/6) gravelly silt loam; weak, medium and fine, subangular blocky structure; very friable; common fine pores; 25 percent gravel; neutral; gradual, wavy boundary.

IIIC2—33 to 51 inches, dark-gray (N 4/0) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive; firm; few medium pores; neutral.

Thickness of the silty deposits over other material ranges from 24 to more than 60 inches. Reaction of the upper horizons is slightly acid to mildly alkaline. Above depths of 40 inches, the profile is mostly silt loam and silty clay loam. The dominant chroma of all subhorizons between the A horizon and a depth of 30 inches is 1 or less. These subhorizons have values of 5 or less. Hues range from 2.5Y to 7.5YR.

Wayland soils are associated on flood plains with well drained Hamlin, moderately well drained to somewhat poorly drained Teel, and poorly drained to very poorly drained Cohoctah soils. They have a more clayey B horizon than all of these soils, and are wetter than Hamlin and Teel soils. Wayland soils are also near and similar to Raynham and Fredon soils, which do not flood. They have a more clayey B horizon than either of these soils, and lack the gravel content of Fredon soils.

Wayland silt loam (Wd).—This level or nearly level soil is on flood plains where water tables are at or near the surface much of the time. Individual areas are long and narrow, and range from 5 to 20 acres.

Included with this soil in mapping were small areas of better drained Hamlin and Teel soils on slight rises and knolls, spots of similar but coarser textured Cohoctah soils, and a few small areas of soils that are shallow and moderately deep over bedrock.

Unless drained, this soil is not suited to farming, but will provide pasture, and is suited to water-tolerant tree species. This soil is subject to flooding; however, most areas are along streams where water levels are regulated for the New York State Barge Canal, and flooding rarely occurs during the growing season. With adequate drainage, this soil is suited to most crops grown in the area. Drainage outlets are difficult to locate in places. Capability unit IIIw–6; woodland suitability group 4w1.

Williamson Series

The Williamson series consists of deep, moderately well drained, medium-textured soils that formed in water- or wind-deposited silt and very fine sand. These soils are nearly level to gently sloping and are on lake plains and uplands where some runoff water accumulates. They are low in lime.

In a representative profile the surface layer is very dark grayish-brown silt loam about 5 inches thick. The upper part of the subsoil is dark-brown, medium acid, very friable silt loam about 15 inches thick. At a depth of about 20 inches, it is separated from the lower part of the subsoil by a layer of mottled, brown, medium acid, friable very fine sandy loam that is 7 inches thick. Below a depth of about 27 inches, the lower part of the subsoil, which is a firm, brittle fragipan, is yellowish-brown and grayish-brown, medium acid silt loam. At a depth of about 40 inches, it merges with a substratum of mottled, dark grayish-brown, layered silt and very fine sand that is friable and neutral.

In spring and during wet periods, Williamson soils have a seasonal high water table within 18 to 24 inches of the surface. This water table is perched on the moderately slowly or slowly permeable fragipan and substratum. Maximum rooting depth is influenced by the depth to the fragipan, and is mainly 15 to 24 inches. Available water capacity in the rooting zone is moderate to high. Available phosphorus and nitrogen are generally medium, and available potassium is low. Reaction in the surface layer is strongly acid to medium acid in unlimed areas. A slight seasonal wetness is the principal limitation to use of these soils for farming.

Representative profile of Williamson silt loam, 3 to 8 percent slopes, in a forest in town of Salisbury, 3/4 mile southwest of Paper Mill Corners:

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2), light brownish-gray (10YR 6/2) dry, light silt loam; weak, medium, granular structure; very friable; many fine and medium roots; few medium pores; pores and old root channels have abundant gray mold; neutral; gradual, smooth boundary.

B21—5 to 11 inches, dark-brown (10YR 3/3), pale-brown (10YR 6/3) dry, light silt loam; weak, medium, subangular blocky structure; very friable; many coarse roots; few fine pores; scattered gray mold in pores; few, washed sand grains; medium acid; gradual, smooth boundary.

B22—11 to 20 inches, dark-brown (10YR 3/3), pale-brown (10YR 6/3) dry, light silt loam; weak, medium, subangular blocky structure; very friable; few medium and fine roots; many medium pores; 3 percent shale chips; medium acid; gradual, smooth boundary.

A'2—20 to 27 inches, brown (10YR 5/3) very fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, thick, platy structure breaking to weak, medium, subangular blocky; friable; few medium and fine roots; common medium pores; 2 percent shale chips; medium acid; gradual, wavy boundary.

B'x—27 to 40 inches, 50 percent yellowish-brown (10YR 5/6), 50 percent grayish-brown (2.5Y 5/2) light silt loam; weak, thick, platy structure breaking to moderate, medium, subangular blocky; firm; brittle; common medium and fine pores; 5 percent shale chips; medium acid; gradual, wavy boundary.

C—40 to 50 inches, dark grayish-brown (10YR 4/2) varved silt and very fine sand; common, medium, distinct, reddish-brown (5YR 4/4) mottles; massive; friable; 3 percent shale chips; neutral.

The solum ranges from 40 to 60 inches in thickness. Reaction is strongly acid to neutral in the solum, depending on liming practices, and is medium acid to neutral in the substratum. Coarse fragments are absent or few. Depth to the A'2 horizon ranges from 12 to 24 inches. Hue ranges from 7.5YR to 2.5Y.

The Ap or A1 horizon has color values of 3 to 5; chroma is 2 or 3. The B2 horizon has color values of 3 to 5; chroma is 3 to 6. This horizon is silt loam to very fine sandy loam. The A'2 horizon has color values of 5 or 6; chroma is 3 or 4. This horizon has common to many, distinct to prominent, high-chroma mottles. It is silt loam to fine sandy loam. The Bx horizon has color values of 4 or 5; chroma is 3 to 6. It is firm and brittle silt loam to very fine sandy loam that has few to many, medium to coarse, distinct to prominent mottles. This horizon ranges from weak, platy to weak, blocky in structure. The C horizon is typically stratified silt and fine sand.

The depth to the fragipan of some of the Williamson soils in Herkimer County is greater than is defined as the range for the series, but this difference does not alter their usefulness and behavior.

Williamson soils are associated on landscapes with Hartland, Agawam, Raynham, Hudson, Phelps, and Teel soils. They have a fragipan that is lacking in all of these soils. Williamson soils are wetter than the well-drained Hartland and Agawam soils, and drier than the poorly drained to somewhat poorly drained Raynham soils. They lack the fine-textured Bt horizon of Hudson soils, and the gravel content and Bt horizon of Phelps soils. Williamson soils contain more silt in the zone above the fragipan than Teel soils, and they are not subject to flooding.

Williamson silt loam, 0 to 3 percent slopes (WIA).—This level to nearly level soil is on landscapes on lake plains and uplands where water- or wind-deposited silt and very fine sand are more than 40 inches thick, and some runoff water accumulates. Individual areas are irregularly shaped, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of wetter Raynham soils in depressions and dried Hartland and Agawam soils on knolls, spots of Hudson soils that have a finer textured subsoil, spots of more gravelly Phelps soils, small areas of Teel soils that flood and are along waterways, and a few small areas where the silt and very fine sand deposits are less than 40 inches thick over glacial till or outwash.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. Slight wetness in places delays planting briefly in spring. Care should be taken to maintain the organic-matter content, because this soil crusts over readily if it becomes depleted. Capability unit IIw-1; woodland suitability group 2o1.

Williamson silt loam, 3 to 8 percent slopes (WIB).—This gently sloping soil is on lake plains and uplands where water- or wind-deposited silt and very fine sand are more than 40 inches thick, and where some runoff water accumulates. Individual areas are irregularly shaped and range from 5 to 30 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of wetter Raynham soils in lower areas and depressions and drier Hartland and Agawam soils on higher elevations, a few spots of Hudson soils that have a finer textured subsoil and more gravelly Phelps soils, and a few small areas where the silt and very fine sand deposits are less than 40 inches thick over glacial till or outwash.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. The hazard of erosion is severe even on slight slopes in cultivated areas that are unprotected. Also, slight wetness in places delays planting briefly in spring. Care should be taken to maintain the organic-matter content, because this soil crusts over readily if it becomes depleted. Capability unit IIe-6; woodland suitability group 2o1.

Windsor Series

The Windsor series consists of deep, excessively drained, coarse-textured soils that formed in sandy glacial water deposits. These soils are nearly level to very steep and are on glacial outwash terraces and deltas. They are very low in lime.

In a representative profile the surface layer is dark yellowish-brown loamy fine sand about 7 inches thick. The subsoil is about 20 inches thick, and is strongly acid. In sequence from the top, the upper 11 inches is strong-brown, loose loamy fine sand; the next 4 inches is strong-brown, very friable fine sand; and the lower 5 inches is dark yellowish-brown, very friable fine sand. The substratum begins at a depth of about 27 inches. It is dark grayish-brown, loose fine sand that is very strongly acid, and extends to a depth of 50 or more inches.

Normally the water table in Windsor soils is at a depth of several feet. In places, however, it begins at a depth of 42 inches. Maximum rooting depth is not restricted, but is mainly 30 inches. Available water capacity in the rooting zone is very low to moderate. Available phosphorous and potassium are generally low. Available nitrogen is generally medium to low. Reaction in the surface layer is strongly or very strongly acid in unlimed areas. Aside from slope and the hazard of erosion, droughtiness and low fertility are the principal limitations to use of these soils for farming. The soils are also subject to soil blowing if left without protective cover.

Representative profile of Windsor loamy fine sand, 3 to 8 percent slopes, in a hayfield in town of Manheim, 1/4 mile north of intersection of Peckville and Carlson Roads:

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; weak, fine, granular structure; loose; many fine roots; medium acid; abrupt, smooth boundary.

B21—7 to 18 inches, strong-brown (7.5YR 5/6) loamy fine sand; weak, fine and very fine, granular structure; loose; few fine roots; strongly acid; gradual, smooth boundary.

B22—18 to 22 inches, strong-brown (7.5YR 5/6) fine sand; weak, very fine, granular structure; very friable; few fine roots; strongly acid; gradual, smooth boundary.

B3—22 to 27 inches, dark yellowish-brown (10YR 4/4) fine sand; weak, fine, granular structure; very friable; few fine roots; strongly acid; abrupt, smooth boundary.

C—27 to 50 inches, dark grayish-brown (2.5Y 4/2) fine sand; single grain; loose; very strongly acid.

The solum ranges from 20 to 30 inches in thickness. It is loamy fine sand to fine sand. The B21 and B22 horizons have color values of 4 or 5; chroma is 4 to 6. Hues range from 7.5YR to 10YR. The B3 and C horizons have color values of 4 or 5; chroma is 2 to 4. Hues are 10YR or 2.5Y. Reaction of the upper horizons is strongly acid to neutral, depending on liming practices. Reaction of the horizons below depths of 20 inches is medium acid to very strongly acid. The solum ranges from weak, fine, subangular blocky in structure to structureless (single grain). Consistence is loose to very friable. The amount of coarse fragments greater than 2 millimeters is less than 5 percent.

Windsor soils are associated on landscapes with Hinckley, Hartland, Agawam, Fredon, and Halsey soils. They lack the high gravel content above a depth of 40 inches that is characteristic of Hinckley soils. Windsor soils have a sandy upper solum that is lacking in Hartland and Agawam soils. They are drier and lack the gravel content of the somewhat poorly drained to poorly drained Fredon soils and the very poorly drained Halsey soils.

Windsor loamy fine sand, 0 to 3 percent slopes (WnA).—This level or nearly level soil is on flatter topography on glacial outwash terraces and deltas. Individual areas are irregularly shaped, and range from 5 to 50 acres.

Included with this soil in mapping were small areas of gravelly Hinckley soils and finer textured Hartland and Agawam soils, and spots of wetter Fredon and Halsey soils in depressions.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. It is droughty and has very low natural fertility. Applications of lime and fertilizer are rapidly leached from this soil, and better response is obtained from smaller but more frequent applications. The hazard of soil blowing is severe if this soil is left without protective cover. Capability unit IIIs–1; woodland suitability group 5s1.

Windsor loamy fine sand, 3 to 8 percent slopes (WnB).—This gently sloping soil is on undulating and smoothly sloping areas, on glacial outwash terraces and deltas. Individual areas are irregularly shaped, and range from 5 to 50 acres. This soil has the profile described as representative for the series.

Included with this soil in mapping were small areas of gravelly Hinckley soils and finer textured Hartland and Agawam soils, and spots of wetter Fredon and Halsey soils in depressions.

This soil is suited to most crops grown in the county and to hay, pasture, or trees. It is droughty and has very low natural fertility. Applications of lime and fertilizer are rapidly leached from this soil, and better response is obtained from smaller but more frequent applications. The hazard of soil blowing is severe and the hazard of water erosion is slight if this soil is left without protective cover. Capability unit IIIs–1; woodland suitability group 5s1.

Windsor loamy fine sand, 8 to 15 percent slopes (WnC).—This moderately sloping soil has a profile similar to the one described as representative for the series except that the subsoil is thinner. It is on rolling and smoothly sloping areas, on glacial outwash terraces and deltas. Individual areas are irregularly shaped, and range from 5 to 30 acres.

Included with this soil in mapping were small areas of gravelly Hinckley soils and finer textured Hartland and Agawam soils, and a few spots of wetter Fredon and Halsey soils in depressions.

This soil is poorly suited to farming because it is extremely droughty. Contour measures to conserve moisture are not feasible in many places, because of the complex short slopes. The soil is suited to hay, early pasture, and trees. The hazard of water erosion is moderate and the hazard of soil blowing is severe if this soil is left without protective cover. Capability unit IVs–1; woodland suitability group 5s1.

Formation, Morphology, and Classification of the Soils

Soil is a natural, three-dimensional body on the earth's surface that supports plants. It has properties resulting from the integrated effects of climate and living organisms acting on earthy parent material, as conditioned by relief over periods of time. Its upper limit is air or water. In this survey area the lateral margins grade into deep water or barren areas of bedrock. The lower limit is the depth where there has been no interaction of the five soil-forming factors: parent material, living organisms, climate, relief, and time. In this area the lower limit of soil is thought to be the normal lower limit of common rootings of perennial plants, for most soils at a depth of 30 to 60 inches.

Factors of Soil Formation

Climate and living organisms, particularly vegetation, are the active factors of soil formation. Their effect on parent material is modified by relief, and by the length of time the parent material has been acted upon by climate and living organisms. The relative importance of each factor differs from place to place. In a few places one factor dominates and fixes most of the soil properties, but normally the interaction of all five factors determines the kind of soil that develops in any given place.

Parent material

The soils of Herkimer County formed in several kinds of parent material. Upland soils formed in glacial till and are shallow to deep over several kinds of bedrock residuum. Several soils formed in glacial outwash and lacustrine sediment on terraces, and a few soils formed in recent alluvium on flood plains. Two soils formed in organic materials.

Glacial drift is all the rock material transported by glacial ice (*5*). It includes all rock material in transport by glacial ice, all deposits made by glacial ice, and all deposits predominantly of glacial origin made in the sea or in bodies of glacial melt water, whether rafted in icebergs or transported in water itself.

Glacial till is drift that has not been sorted by water. Stratified drift has been at least partly sorted by water. The glacial soils of the survey area formed, for the most part, in glacial till. Some of these soils, however, have lithologic discontinuities between the upper and lower horizons. Also these soils generally have a textural difference between the upper and lower horizons, with some of the upper horizons often expressing a slight amount of sorting. This condition is thought to be caused by eolian (wind) sortings; solifluction, the viscous flowage of the upper horizons; or by ablation till material that was deposited in and over the ice instead of under the ice sheet.

Most of the glacial till in Herkimer County is local in nature, and its composition is greatly influenced by the local bedrock. As an example, the deep, limestone-dominated Honeoye soils are in the same soil association as the Wassaic and Farmington soils that are moderately deep and shallow over limestone bedrock. Mohawk soils are strongly influenced by the black Utica Shale bedrock that is at depths of 40 to 60 inches. Nearly all the soils in the survey area, however, have traces of sandstone and granite material from the Adirondacks, as well as at least a few black shale chips. These scattered chips from the Utica Shale Formation have resulted in many of the soils in Herkimer County being darker and grayer, and having a higher pH than the defined range for the series.

A large number of the soils of the survey area formed in thin deposits of glacial till over the many kinds of bedrock in Herkimer County. Palatine soils formed in glacial till high in black calcareous Utica Shale, and Manlius and Nassau soils formed in glacial till high in acid, grayish-brown Frankfort Shale. Most of the soils that formed in thin deposits of glacial till over bedrock also have been influenced by glacial drift from other areas. Although the Wassaic soils formed in glacial till over limestone bedrock, they have a high percentage of sandstone gravel, cobblestones, and stones transported from other areas by glacial ice.

Soils formed in glacial outwash vary with the source of the outwash. Palmyra soils, which for the most part are in the town of Winfield, formed in outwash that is dominated by limestone gravel and cobblestones. Limestone is the common bedrock in the southwestern part of the county. Howard soils, however, which are mostly concentrated in the valleys of the Mohawk River and East and West Canada Creeks, formed in a mixture of black and gray shale chips, limestone, sandstone, granite sand, gravel, and cobblestones. The Howard soils are in valleys that drain areas containing many kinds of bedrock.

Lacustrine soils in the county formed from material deposited as sediment in proglacial lakes. This sediment is between 40 and 60 inches thick in most areas, and has a textural range from very fine sandy loam to clay, depending on the source and the way deposited. The silty Hartland soils mostly formed from material laid down in moving water or from sediment low in clay, whereas the Hudson soils formed in clayey material deposited in still water.

525-444—75——11

The alluvial soils of the survey area formed in very silty to sandy material recently deposited on flood plains. Hamlin, Teel, Wayland, and Cohoctah soils formed in this material.

Living organisms

Herkimer County was originally nearly all forested, except for small areas of Fresh water marsh. The trees consisted mostly of deciduous hardwoods and a few conifers. Many of the soils have thin, dark-colored A1 horizons and weak, leached A2 horizons. These are indications that the soils formed under forest conditions.

Earthworms and other macro-organisms recycle organic materials from the soil surface to lower horizons. This material is grass, tree, and animal litter. Man also influences the soil, by mixing the plow layer when he plows and prepares the land for crops, by adding lime amendments that permit the growth of crops requiring a higher pH, and by adding fertilizers that encourage luxuriant plant growth. As technological advances permit more intensive farming practices, man increasingly becomes one of the more dominant factors in the process of soil formation.

Climate

The cool-temperate, continental type of climate in Herkimer County affects soil formation. Rainwater percolates downward and leaches soluble salts from higher to lower horizons, frost action mixes the upper soil horizons, and heating and cooling vary microbial activity and speed up or slow down the interaction of the other soil-forming factors.

Relief

The shape of the land surface, the slope, and the relation to the water table have a great influence on the formation of Herkimer County soils. Soils that have convex or steep slopes lose part of their rainfall to more gently sloping and concave areas. In places these conditions result in a sizable difference in the amount of water that is taken into the soil in different positions on the landscape. Soils with large amounts of runoff have less water percolating through them and less leaching of substances from upper to lower horizons. They are also more droughty, and have less plant growth and organic matter than soils that retain all their rainfall. In addition, these areas are subject to erosion when left without a surface cover. Soils that receive runoff from higher areas have more water available for leaching and for plant growth. Soils with slow permeability in low spots and depressions generally receive excess water from higher areas. These soils remain waterlogged for long periods of time. This results in a buildup of organic matter because of reduced microbial activity, and gleying of the subsoil because of a lack of oxygen.

Time

Most soils have formed over long periods of time, but the soils of Herkimer County have had to form in the geologically short time of 10,000 years or less, which is the period since the last glaciers melted in the area. Alluvium along streams and organic material in bogs are still being deposited. Soils formed in recently deposited materials have little profile development. Most of these soils in Herkimer County are classified as Inceptisols. Soils formed in glacial till that has been subjected to weathering by the soil-forming factors have distinct horizons and well-developed profiles. Alfisols and Spodosols are examples of these kinds of soils.

Morphology of the Soils

Soil horizons are a product of the mechanical and chemical weathering that results from interaction of the five soil-forming factors. Weathering is basically a combination of destruction and synthesis. Rocks, which are the original starting point in the weathering process, are first broken down into smaller rocks, and eventually into individual minerals in the weathering process. They are changed into new minerals either by minor modifications or by complete physical changes. Many of these processes are interrelated, but the basic mechanical weathering processes are considered to be thermal expansion, crystal growth, organic activity, and colloid plucking (*8*). These processes break rock down into small fragments so that the chemical weathering processes of hydration, hydrolysis, oxidation, carbonation, and solution can act upon the parent material that makes up the soil profile.

The formation of individual horizons within the soil profile are the results of both of these processes, which result in leaching of salts that are more or less soluble, accumulation of organic matter, weathering of primary minerals into secondary minerals such as silicate clays and their eventual destruction or resynthesis into even more stable compounds, translocation of silicate clay minerals from one horizon to another by percolating water, chelating of illuviated iron and aluminum, formation of dense or compact layers in the subsoil, segregation of soil separates through freezing and thawing, and mechanical mixing by organisms. Some of these processes take place in all soils, but the number of active processes and the degree of activity vary from one soil to another.

The profiles of most soils in Herkimer County are separated into a surface layer or A horizon, a subsoil or B horizon, and a substratum or C horizon. Some soils have a horizon of consolidated bedrock either below the C horizon or in place of it.

The surface horizons of mineral soils have an accumulation of organic matter from decaying plant and animal residues. In wooded areas there can be an accumulation of surface litter over the mineral surface layer. This accumulation is designated as an O1 or O2 horizon, depending on the extent of decomposition of the organic material. Most cultivated soils have an Ap horizon, representing the depth of soil that has been mixed by plowing or cultivation. This horizon, rich in organic matter, is designated as an A1 horizon in soils that have not been plowed. Some A horizons have a zone of eluviation, called an A2 horizon. Percolating water has leached clay, organic matter, and salts made soluble by acids from decaying organic matter out of this horizon. As a result, it is generally the lightest colored horizon in the profile because of the light color of the more resistant minerals such as quartz grains.

The B horizon, or subsoil, is a zone of illuviation. Clay leached from the A horizon often accumulates on ped surfaces in the subsoil, forming an argillic or B2t horizon. Aluminum, iron, and organic matter leached from the surface soil are fixed in the subsoil by a chelating process in some of the Herkimer County soils. These, because of an accumulation of ferric iron, often form reddish horizons called spodic or Bir horizons. A cementing process has occurred in some subsoils to form a fragipan, or Bx horizon. Fragipans have a brittle consistency when moist.

Some subsoils are called altered, or cambic, B horizons. The alteration is produced by movement of soil particles by frost, roots, and animals and aggregation of soil particles into peds; by hydrolysis of some of the primary minerals to form clays and liberate sesquioxides; by solution and redistribution or removal of some carbonates; and by oxidation, reduction and segregation, or removal of free oxides. The cambic horizon has lost sesquioxides or bases, or both, through leaching. Gains have occurred in content of organic matter and water, but the alteration of the cambic horizon is not the result of additions of mineral substances.

Mottling and gleying can be present in all major horizons, but they are probably most common in the subsoil. These reddish, grey, or neutral colors are the result of wet conditions whereby microbial and chemical processes reduce iron from the ferric to the ferrous state. The extent of mottling indicates the extent of the reduction process, with gray or bluish-gray gleying representing the highest amount of reduction. Since the amount of reduction is an indication of lack of air and excess of water, the amount of soil wetness is usually measured by the amount of mottling. Soils with no low-chroma mottles above a depth of 20 inches are considered well drained. Moderately well drained soils have a few mottles above a depth of 20 inches. Somewhat poorly drained soils have many mottles in the subsoil and can have some mottles in the A2 horizon. Poorly drained soils have many mottles in the surface layer and subsoil. Very poorly drained soils generally have a gleyed subsoil and mottled, mucky surface layer.

The C horizon or substratum is little changed from the original parent material. It consists of such resistant material, or lies at such a depth below the soil surface, that the physical and chemical weathering processes have not had time to alter it appreciably.

Classification of the Soils

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*4*) and later revised (*9*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 and supplemented in March 1967 and September 1968 (*11*). This system is under continual study.

Table 9 shows the classification of each of the soil series represented in Herkimer County, Southern Part, according to the current system. This system defines classes in terms of observable or measurable properties of soils (*6*). The properties chosen are primarily those that permit the grouping of soils that are similar in genesis. The classification system is designed to encompass all soils. It has six categories. Beginning with the most inclusive, they are the order, suborder, great group, subgroup, family, and series. These are briefly defined in the following paragraphs.

TABLE 9.—*Classification of soil series by higher categories*

Series	Family	Subgroup	Order
Agawam [1]	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Entic Haplorthods	Spodosols.
Allis [1]	Fine, illitic, acid, mesic	Aeric Haplaquepts	Inceptisols.
Appleton	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Bombay [1]	Coarse-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Broadalbin [1]	Coarse-loamy, mixed, mesic	Typic Fragiochrepts	Inceptisols.
Burdett	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Canton [1]	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Entic Haplorthods	Spodosols.
Carlisle	Euic, mesic	Typic Medisaprists	Histosols.
Cohoctah	Coarse-loamy, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Conesus [1]	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Farmington	Loamy, mixed, mesic	Lithic Eutrochrepts	Inceptisols.
Fredon [1]	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols.
Halsey [1]	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic.	Mollic Haplaquepts	Inceptisols.
Hamlin	Coarse-loamy, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Hartland	Coarse-silty, mixed, mesic	Entic Haplorthods	Spodosols.
Herkimer	Coarse-loamy, mixed, mesic	Dystric Eutrochrepts	Inceptisols.
Hilton [1]	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Hinckley [1]	Sandy-skeletal, mixed, mesic	Entic Haplorthods	Spodosols.
Honeoye	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Hornell	Fine, illitic, acid, mesic	Aeric Haplaquepts	Inceptisols.
Howard	Loamy-skeletal, mixed, mesic	Glossoboric Hapludalfs	Alifisols.
Hudson	Fine, illitic, mesic	Glossoboric Hapludalfs	Alfisols.
Ilion	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols.
Lairdsville, loamy subsoil variant.	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Lamson	Coarse-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Lansing	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Lima [1]	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Lockport, loamy subsoil variant.	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Lyons	Fine-loamy, mixed, nonacid, mesic	Mollic Haplaquepts	Inceptisols.
Manheim	Fine-loamy, mixed, mesic	Udollic Ochraqualfs	Alfisols.
Manlius	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Massena [1]	Coarse-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Mohawk	Fine-loamy, mixed, mesic	Mollic Hapludalfs	Alfisols.
Mosherville	Coarse-loamy, mixed, mesic	Aquic Fragiochrepts	Inceptisols.
Nassau	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts (Entic Fragiorthods).	Inceptisols.
Ontario	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Palatine	Loamy-skeletal, mixed, mesic	Typic Eutrochrepts	Inceptisols.
Palms	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Palmyra [1]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Phelps [1]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Glossaquic Hapludalfs	Alfisols.
Raynham	Coarse-silty, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Rhinebeck	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Sun	Coarse-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Teel	Coarse-loamy, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Wassaic	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Wayland	Fine-silty, mixed, nonacid, mesic	Mollic Fluvaquents	Entisols.
Williamson [1]	Coarse-silty, mixed, mesic	Typic Fragiochrepts	Inceptisols.
Windsor	Sandy, mixed, mesic	Entic Haplorthods	Spodosols.

[1] Some of the soils in these series have characteristics that are slightly outside the range of characteristics defined for the series. The differences are in color, texture, reaction, or thickness of the solum.

ORDER.—Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. Six of these orders are represented in Herkimer County. These are the Inceptisol, Spodosol, Alfisol, Mollisol, Entisol, and Histosol orders. Inceptisols are weakly developed mineral soils. They have cambic horizons and may have a fragipan. Spodosols have a spodic horizon in the subsoil. In Herkimer County these horizons have redder colors than the rest of the horizons in the soil profile, due to the presence of illuviated iron. Soils classified as Alfisols have argillic horizons in the subsoil. These horizons are identified by the presence of clay films on the ped surfaces. Mollisols have thick, dark surface horizons called mollic epiedons. Entisols are recent soils that do not have genetic horizons or have only the beginnings of such horizons. Histosols are organic soils and are more than 30 percent organic matter if the mineral fraction is 50 percent or more clay, and 20 percent or more organic matter if the mineral fraction has no clay.

SUBORDER.—Each order is divided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic homogeneity. Each suborder name consists of two syllables; the first is suggestive of the class, and the second is suggestive of the name of the order. The suborders narrow the broad climatic range permitted in the orders. Soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The suborder is not shown in the table.

GREAT GROUP.—Soil suborders are separated into great groups largely on the basis of the presence or absence of diagnostic horizons and the arrangement of those horizons. Horizons used as differentiae include those horizons that contain illuvial clay, iron, and humus; thick, dark-colored surface horizons; pans that interfere with root development, water movement, or both; and anthropic horizons, which form under cultivation. Diagnostic features have also been used in this category where differences in horizons are not relevant. Examples are the self-mulching properties of some clays, the dark-red and dark-brown colors associated with basic rocks, wide difference in base saturation, the property of irreversible hardening, the tonguing of eluvial horizons into illuvial horizons, and low soil temperatures. From the viewpoint of soil morphology, each great group is thought of as uniform with respect to kind and arrangement of diagnostic horizons and features. From a genetic viewpoint, the great groups may be considered as segments of the continuance of soils and spaced with as nearly equal uniformity as our present knowledge permits. The great group is not shown in the table because the name of the great group is the last word in the name of the subgroup.

SUBGROUP.—Great groups are divided into subgroups, one representing the central (typic) segment of the group and others, called intergrades, that have properties of one great group, and also one or more weakly expressed properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group.

FAMILY.—Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or the behavior of soils when used for engineering. Among the properties considered are texture, amount of coarse fragments, mineralogy, reaction, soil temperature, depth of soil, and consistence.

SERIES.—This is a collection of individual soils essentially uniform in differentiating characteristics and in arrangement of horizons. It is defined on the basis of morphological characteristics below plow depth. Soils of the same series with contrasting surface textures are designated as phases of that series. Some of the differentiating characteristics that separate soil series are arrangement of horizons, color, structure, texture, reaction, consistence, content of coarse fragments, mottling, and mineralogical and chemical composition.

General Nature of the County

Herkimer County was formed from Montgomery County in 1791. As originally laid out, it covered a large part of the central and northeastern sections of the State. The present boundaries were established in 1817.

The general population trend has been upward. The census shows that there were 51,049 people living in Herkimer County in 1900. In 1920 there were 64,962 inhabitants; in 1940, 59,527; in 1960, 66,370; and in 1970, 67,633. The projected population for 1980 is 72,500.

The greatest population concentration in the county is along the Mohawk River. Lesser concentrations are along East and West Canada Creeks, the Unadilla River, and along the Fulton chain of lakes in northern Herkimer County.

Climate [8]

The following description of the climate of Herkimer County pertains only to the southern half, or that part of the county lying south of the Adirondack Forest Preserve.

The climate of Herkimer County, Southern Part, is classified as humid-continental. The land areas of the North American continent are the primary source of air masses and weather systems which affect the region. The role of the Atlantic Ocean is secondary, although it contributes some maritime characteristics to the climate. Currents in the upper atmosphere bring moisture to the region from the Gulf of Mexico and Atlantic Ocean, and give the climate its humid attribute.

The normal movement of atmospheric pressure systems toward the northeastern United States results in a variety of weather. Temperature, humidity, wind, and other weather conditions generally undergo noticeable change within a few days. The weather in a given week often differs from conditions prevailing during the preceding or subsequent week. There are occasions, however, when a pattern of weather persists for many days without ap-

[8] By A. BOYD PACK, climatologist for New York, National Weather Service, U.S. Department of Commerce.

preciable change. Variation in seasonal weather from year to year is a characteristic of the climate.

A summary of temperature and precipitation data is given in table 10. Table 11 shows the probability of the last freezing temperature in spring and the first in fall.

Southern Herkimer County has pleasantly warm summers, but the winters are long and cold. The climate is conducive to much cloudiness and unsettled weather during the colder months. Precipitation averages near 4.5 inches per month from April through September, but decreases to a minimum of about 3 inches per month in January and February.

Topography has an important influence on the climate of the county. River valleys alternating with uplands and terrain of variable slope can result in important variations of temperature and other aspects of climate within relatively short distances. Occasionally during the colder months, vigorous atmospheric circulation off Lake Ontario produces strong winds and showers of rain or snow in southern Herkimer County. Normally, however, lake influence on the climate is minor.

Temperatures of 90° F. or higher occur on an average of 8 to 12 days per year in the Mohawk River Valley. The number of such days in the higher elevations is usually less than 5. The incidence of subzero temperatures also varies in southern Herkimer County, from about 15

TABLE 10.—*Temperature and precipitation data*

[Based on 30-year period of record at Little Falls]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	7 years in 10 will have— Maximum temperature equal to or higher than—	7 years in 10 will have— Minimum temperature equal to or lower than—	Average total	3 years in 10 will have— More than—	3 years in 10 will have— Less than—	Snow: Average total	Snow: 7 years in 10 will have more than—
	° F.	° F.	° F.	° F.		In.	In.	In.	In.
January	28	11	43	−10	2.5	3.1	1.9	20	13
February	30	13	43	−5	2.4	2.9	2.0	19	14
March	39	21	53	7	2.6	3.2	1.9	14	10
April	55	33	74	20	3.7	4.4	3.1	4	1
May	68	44	79	29	3.9	4.7	3.1	1	[1] 1
June	77	53	88	40	3.9	4.6	3.0	--------	--------
July	81	58	88	47	4.1	5.0	3.8	--------	--------
August	79	56	87	44	3.8	4.3	3.1	--------	--------
September	72	49	85	34	3.8	4.7	3.1	--------	--------
October	61	39	76	26	3.3	3.9	2.3	(2)	[1] 1
November	45	30	61	17	3.3	3.8	2.7	6	3
December	32	16	45	−5	3.0	3.7	2.4	15	10
Year	56	35	92	−13	40.3	42.0	38.2	79	65

[1] One year in ten will have more than a trace.
[2] Trace.

TABLE 11.—*Probability of last freezing temperature in spring and first in fall*

[Based on records at Little Falls, elevation 890 feet]

Probability	Dates for given probability and temperature— 16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	April 5	April 24	April 28	May 17	May 27
2 years in 10 later than	April 2	April 18	April 25	May 11	May 23
5 years in 10 later than	March 23	April 6	April 14	April 29	May 15
Fall:					
1 year in 10 earlier than	November 8	October 29	October 13	September 26	September 18
2 years in 10 earlier than	November 13	November 1	October 18	September 29	September 21
5 years in 10 earlier than	November 22	November 12	October 30	October 9	September 30

days per winter in the river valley to up to more than 25 days in the normally colder uplands. In most winters, the coldest temperature ranges from minus 10° to 25° F.

The freeze-free growing season has an average length of about 140 days along the Mohawk River, but only about 15 days in the approaches to the Adirondack Forest Preserve.

Annual precipitation increases from south to north in southern Herkimer County, from about 40 inches along and south of the Mohawk River, up to 45 to 50 inches in the uplands north of the river. The growing-season period from May through September accounts for about 50 percent of the annual precipitation, and follows the same directional pattern. The distribution of rainfall is normally adequate for the production of crops. Drought is not a serious hazard to farming, but its possibility should not be disregarded in long-range planning.

Snowfall is heavy throughout Herkimer County. Average yearly amounts vary from about 65 inches in the southern extremity to 120 inches near the Forest Preserve boundary. Measurable snow can be expected in the higher elevations by early November, and snowstorms in late April or early May are not uncommon. A cover of snow is generally present from early December to late March, or until early April in the higher elevations.

Geology

Geologic formations (fig. 12) spanning from the Recent Quaternary Period in the Cenozoic Era to Precambrian times of more than 6 hundred million years ago crop out in the survey area of Herkimer County (*13*). The wide assortment of material is a result of several conditions. The Mohawk River bisects the area and has exposed a wide range of rocks in forming its present channel. Also, Herkimer County is so situated that the northern edge of the survey area borders on the Adirondack Mountains and its abundance of crystalline rocks, and the extreme southern part of the survey area is on the edge of the Catskill Mountains where there are sedimentary siltstone, sandstone, and shale. A further complicating factor is that the northern part of the survey area was uplifted during the formation of the Adirondacks, as evidenced by the numerous faults in the area that have their downthrown side away from the Adirondack Mountains. This uplift accelerated erosion, so that, in general, older rocks are exposed north of the Mohawk River.

Many of the soils of the survey area formed in glacial till that contains much material from these exposed formations. The glaciers that repeatedly overran the area moved and mixed the parent rock material, and many of the soils formed in such various glacial tills. The Mohawk River and the East and West Canada Creeks acted as proglacial streams when the ice sheets lay to the north of the Mohawk River. During these periods the major streams were choked with coarse-textured sand, gravel, and cobblestones from the glacial melt water. When the Mohawk River was blocked by ice to the east, these stream valleys were flooded, and lacustrine sediment was laid down over the outwash and over glacial till and bedrock in a few spots. Steele Creek was an overflow outlet to the south that drained one of these proglacial lakes. The outwash deposit from Cedarville to West Winfield in the Howard-Phelps association is a result of this overflow channel.

The present-day major streams are underfit for their valleys. This means that they carry much less water and sediment than during former times. The alluvial soils in the Alluvial land-Hamlin-Teel association formed in alluvium recently laid down by these streams. Most of this alluvium mantles coarser sediments or outwash deposited during glacial periods.

Soils of several associations formed in outwash from proglacial streams. Herkimer association soils formed in sediment dominated by outwash having a high content of Utica Shale. Howard-Phelps and Howard-Fredon associations soils formed in outwash consisting of mixed limestone, sandstone, and granitic material. The Hinckley-Windsor association soils are high in content of granitic sand and gravel from the Adirondacks. Some areas of these outwash associations are indicated as Quaternary glacial and alluvial deposits on the bedrock geology map.

Key to Figure 12, Bedrock Geology of Herkimer County (*13*)

Number	Formation	Geologic Period	Geologic Era
1	Glacial and alluvial deposits—underlying geology unknown	Quaternary	Cenozoic.
2	Hamilton group—shale, siltstone	Middle Devonian	Paleozoic.
3	Onondaga limestone and Ulster group—limestone, sandstone	Middle Devonian	Paleozoic.
4	Helderberg group—limestone	Lower Devonian	Paleozoic.
5	Cobleskill limestone, Bertie and Saline groups—limestone	Upper Silurian	Paleozoic.
6	Cobleskill limestone, Bertie and Saline groups—Vernon shale	Upper Silurian	Paleozoic.
7	Lockport group—Ilion shale	Middle Silurian	Paleozoic.
8	Clinton group—Herkimer sandstone	Middle Silurian	Paleozoic.
9	Lorraine group—Frankfort shale, siltstone	Upper Ordovician	Paleozoic.
10	Trenton group (black shale)—Utica shale	Middle Ordovician	Paleozoic.
11	Trenton group (limestone)—limestone	Middle Ordovician	Paleozoic.
12	Beckmantown and Saratoga Springs Group—limestone, dolomite	Lower Ordovician	Paleozoic.
13	Beckmantown and Saratoga Springs Group—Little Falls dolomite	Upper Cambrian	Paleozoic.
14	Rocks of igneous origin, generally metamorphosed—undivided metasedimentary rock and related migmatite.		Precambrian.
15	Metamorphic rocks of uncertain origin—syenitic gneisses, or quartz syenitic gneisses.		Precambrian.

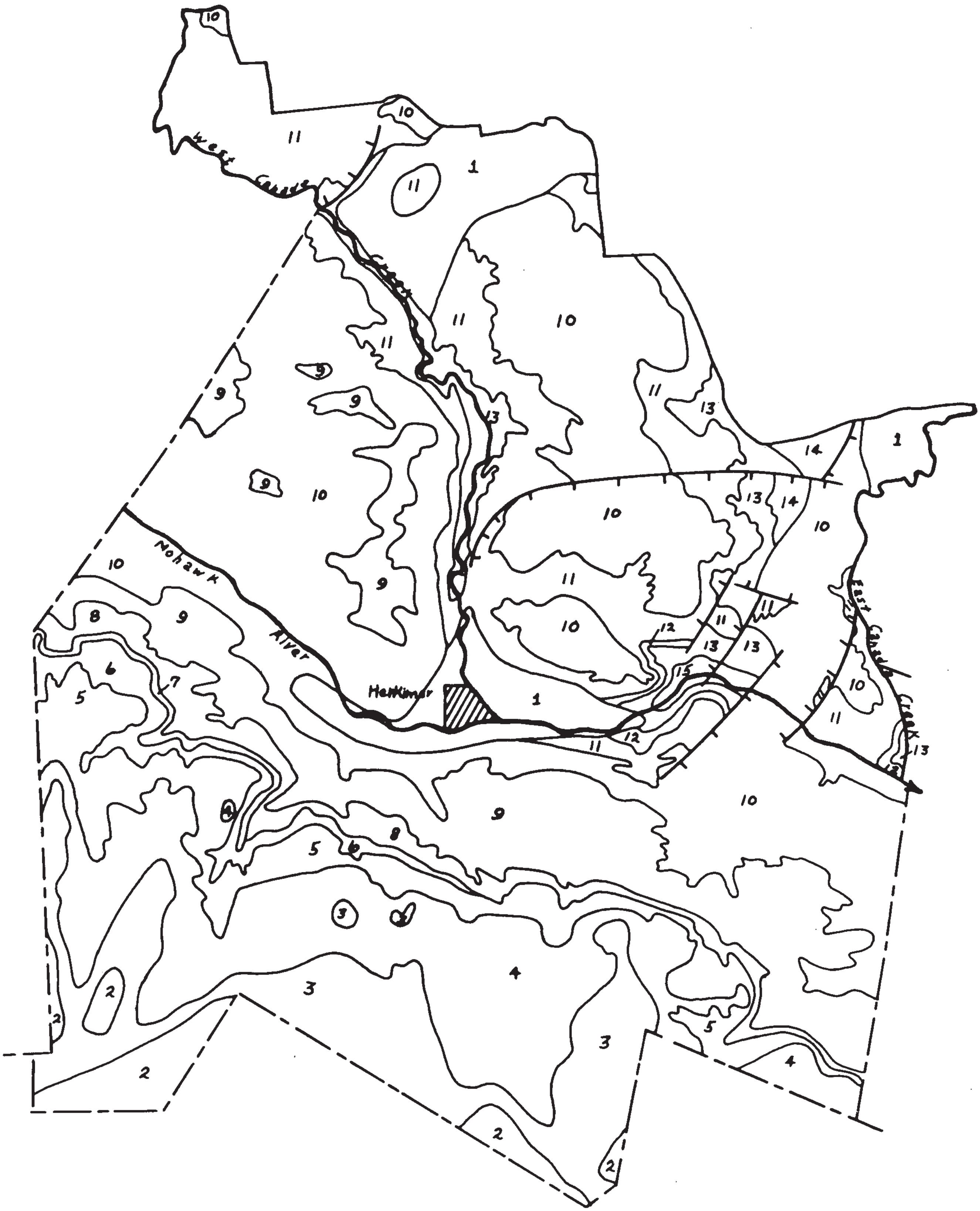


Figure 12.—Bedrock geology of Herkimer County. **Key to this map** explains the numbered areas.

The major soils of the Hudson-Rhinebeck association formed in sediment deposited in proglacial lakes. In most areas, this fine-textured sediment is 40 to 60 inches deep over outwash, till, or bedrock.

A close correspondence exists between the upland soil associations and the bedrock geology map. The Honeoye-Wassaic-Farmington association soils formed from till high in Middle Devonian to Upper Silurian rocks, such as the Onondaga, Helderberg, and Cobleskill Limestone and Sandstone. Nearly all of the drumlins in the county are in this association. They extend in an east-west direction, the result of lateral movement of the ice sheet south of the Adirondack Mountains.

The Hilton-Appleton-Ontario association soils formed mostly in till derived from the Upper and Middle Silurian Formations of Vernon Shale, Ilion Shale, and Herkimer Sandstone. The major soils of the Mohawk-Manheim association formed in till derived mainly from Middle Ordovician rocks, the black Utica Shale of the Trenton Group.

Manlius and Hornell soils of the Lansing-Hornell-Manlius and Mohawk-Manlius-Hornell associations formed in till derived mainly from acid Frankfort Shale. of the Lorraine Group. Some soils, such as the Lansing, Conesus, and some Manheim and Ilion soils, formed in till derived from a mixture of several rock types, none of which are dominant. The Manheim-Conesus-Lansing and Lansing-Hornell-Manlius association soils are examples of soils in which these types of till material dominate. In these associations the glacial till formed from a mixture of Frankfort and Utica Shales, and had some influence from Sandstone and granitic rocks of the Adirondacks. One exception is the small area of Lansing-Hornell-Manlius association soils south of the village of West Winfield and west of the village of Warren. In these areas the Hamilton Shales and Siltstones dominate the till material.

Glacial-till soils in the northern part of the survey area are dominated by granitic material from the Adirondack mountains, even though the area in places is underlain with other rocks. The Trenton Limestone north of the village of Poland, and the Trenton Limestone and Utica Shale that form the bedrock under the Broadalbin-Canton association, are areas where the soils have been dominated by sandstone and granitic material from the Adirondacks.

Physiography and Drainage

Herkimer County includes parts of three major physiographic provinces: the Adirondack Mountains to the north, the Mohawk lowlands along the Mohawk River, and the dissected Allegheny Plateau in the extreme southern section of Herkimer County.

The lowest elevation in the survey area is 300 feet in the Mohawk Valley along the Mohawk River on the Herkimer-Montgomery County line. The highest elevation is 1,873 feet in the extreme southwestern part of Herkimer County, south of Birmingham Corners. The lowest elevations are in the Mohawk lowland. Elevation increases away from the lowland and toward the Adirondack mountains to the north, and the Allegheny plateau to the south. Elevation also increases slightly from east to west.

Drainage is dominated by the Mohawk River (fig. 13). A small area in the southwestern part of the county drains into the Susquehanna River system. The Mohawk River is the only major stream in the area flowing west to east. Other main drains are generally north-south oriented. During glacial times, the Mohawk River and East and West Canada Creeks were proglacial streams in periods when the Mohawk-Hudson drainage was not blocked by glacial ice. These valleys are partly filled with coarse sediment from glacial streams. Lacustrine sediment mantling some of the outwash, and the glacial till at lower elevations, indicate this drainage to the east was periodically blocked by ice. The Steele Creek drainage south of Ilion was reversed by one of these proglacial lakes when it served as a south-flowing overflow channel.

The landscape in Herkimer County is geologically young, having been glaciated as recently as 10,000 years ago. It has the following characteristics: Few consequent trunk streams and few large tributaries are present. Numerous short tributaries and gullies extend themselves by headward erosion and develop dendritic valley systems. A general lack of flood plain development is evident. Stream meanders do exist, but they are closely confined meanders in valleys incised below the upland surface. Interstream tracts are extensive and poorly drained. Drainageways have not had enough time to cut back into uplands and drain these swamps and marshes;

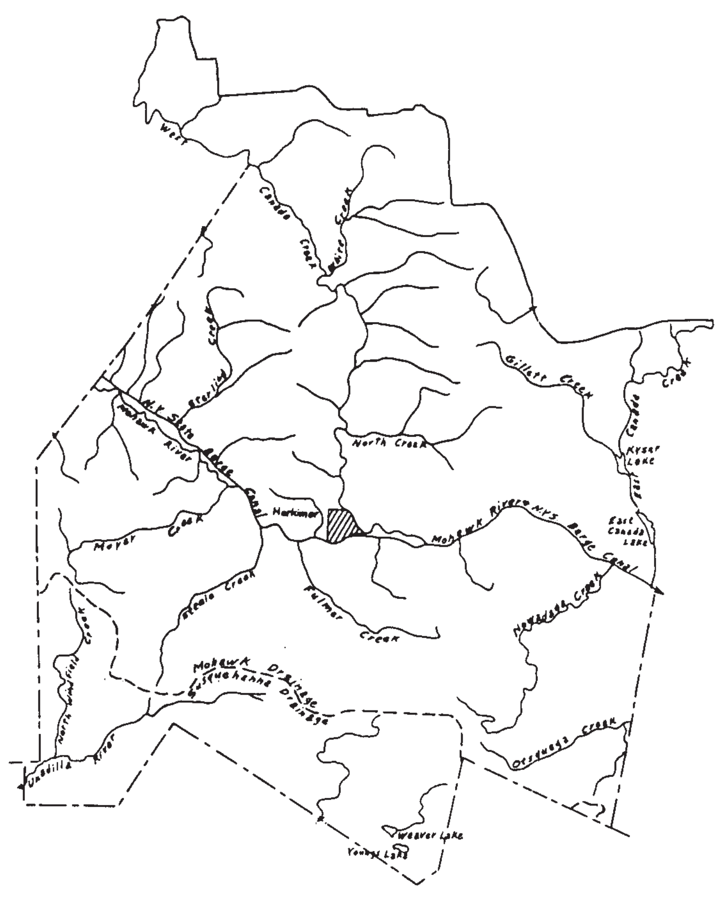


Figure 13.—**Drainage patterns in the southern part of Herkimer County.**

this is why the stream divides are broad and poorly defined. Numerous waterfalls and rapids exist along the steep valley walls where streams cross beds of resistant rock.

Industry, Transportation, and Markets

Herkimer County has many industries. The majority of them are in the Mohawk Valley and a few are in the East and West Canada Creek Valleys. Wood and forestry product industries are important to the local economy. Many sawmills are scattered through the county. Several furniture factories are located in Herkimer, and a bat factory is located in Dolgeville. Many other wood-product factories are scattered through the valley areas. Rifles and shotguns are manufactured in Ilion. Several firms manufacture electronic components in the Herkimer-Ilion area. Many clothing factories producing shoes, dresses, children's clothes, and the like, are located in the county. One unique industry is the mining of Herkimer diamonds (quartz crystals) in the Middleville area. The cheese industry, once highly important to the economy, has declined in recent years. Most of the working force in the county is employed in these and other factories both in Herkimer and in Oneida Counties. The result of this high degree of industrialization is that most of the people in the county are dependent on the factories and related businesses for their income, and a lesser number is employed in farming and other agricultural pursuits.

The Penn-Central and Erie-Lackawanna Railroads serve the county. The Mohawk Valley is a main route of the Penn-Central, where sets of tracks are on either side of the Mohawk River. Two Federal highways cross the county, the New York State Thruway in the Mohawk Valley, and U.S. Highway No. 20 near the southern county line. An exit for the New York Thruway is located in Herkimer. Sixteen State highways are located within the county. The New York State Barge Canal is in the Mohawk River flood plain and is a source of water transportation for barges and pleasure boats. Petroleum products are the principal goods transported by water in the county. The closest commercial airport is the Oneida County Airport, about 22 miles west of the village of Herkimer.

Farming and Land Use

The 1969 agricultural census shows that 21.6 percent of the land in Herkimer County, or 197,903 acres, is in farms. Most of this acreage is in the survey area. This includes 121,289 acres in crops, 32,256 acres in trees, 84,501 acres in pasture, and 13,165 acres in other land uses.

Dairying is the principal type of farming. It has been associated with the economy of the county for many years. Before the completion of the Erie Canal, which was forerunner of the present New York State Barge Canal in 1820, Herkimer County sold large amounts of grain in the New York City area. After the Erie Canal was completed, the improved transportation it offered made it impossible to compete with the farming land in the west for the grain market, so Herkimer County farming became centered around the dairy industry. The result was a highly developed cheese industry in the mid-1800's, and the county became famous for cheese products. Small cheese factories were scattered throughout the county and were situated so that most farmers could make milk deliveries to them by horse and wagon several times a week. With the development of rapid forms of transportation and modern refrigeration, farmers began to sell whole milk in metropolitan areas around New York City. Most of the milk and other dairy products produced in the county now is sold to this metropolitan New York-New Jersey market and to the local market. There were 25,103 milk cows in the county in 1969. The present trend in dairying is to rely mostly on silage corn, and hay and pasture, with increasing use of silage as a feed source. In addition, most farmers buy some concentrates for their dairy cattle, although growing their own concentrates, mostly corn for grain, is becoming more widespread.

Livestock is purchased and sold at several local public auctions in the survey area. Vegetables and fruit are nearly all produced for and sold on the local market, often from roadside stands.

Some of the minor farming enterprises of the survey area are beef cattle operations, chickens for egg production, vegetable truck farming, orchards, snap beans, and berries (mostly strawberries). The trend in the county has been to increase the size and decrease the number of farms. Between 1964 and 1969 the number of farms decreased from 1,243 to 885, and average farm size increased from 204 to 225 acres. Crop acreages presently on the increase are hay and alfalfa, corn for silage and grain, barley, dry beans, and peas. Acreages of oats and snap beans have been on the decline in the past few years.

Agricultural enterprises that cater to an urban population interested in beautification and outdoor recreation have been on the increase. A general increase has taken place in the number of units and the amount of sales of nursery and florist products, seeds, plants, bulbs, Christmas trees, and recreational products and services.

Water Supply

Most people in rural areas obtain their water supply from wells, developed springs, and constructed ponds. These are adequate during periods of normal rainfall, but due to the local nature of most of such water supplies, they can become critically inadequate during prolonged dry periods.

The larger villages and cities get their water from wells, small streams, and from watersheds. Watersheds, which are the water source for most villages and cities with populations of more than 5,000, have been developed for this use by reforestation, development of springs, and construction of dams to conserve surface runoff. They are often some distance from the heavily populated areas, so water at times has to be piped long distances. The village of Herkimer transports its water by pipeline from a watershed in the town of Russia, about 17 miles away. These developed watersheds have proved to be fairly dependable sources of water, and less susceptible to drought than smaller sources developed for individual use.

Literature Cited

(1) ALLAN, PHILIP F., GARLAND, LLOYD E., and DUNCAN, R. FRANKLIN.
1963. RATING NORTHEASTERN SOILS FOR THEIR SUITABILITY FOR WILDLIFE HABITAT. Transactions of the Twenty-Eighth North American Wildlife and Natural Resources Conference, pp. 247–261, illus. Wildlife Management Institute, Washington, D.C.

(2) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1970. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 10, 2 v., illus., Washington, D.C.

(3) AMERICAN SOCIETY FOR TESTING AND MATERIALS.
1968. ASTM STANDARDS. In Part 11. American Society for Testing and Materials, Philadelphia.

(4) BALDWIN, M., KELLOGG, C. E., and THORP, J.
1938. SOIL CLASSIFICATION. U.S. Dept. Agr. Yearbook, pp. 979–1001, illus.

(5) FLINT, RICHARD F.
1957. GLACIAL AND PLEISTOCENE GEOLOGY. John Wiley and Sons, Inc., New York. 553 pp., illus.

(6) SIMONSON, ROY W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. Science 137: 1027–1034, illus.

(7) STOUT, NEIL J.
1958. ATLAS OF FORESTRY IN NEW YORK. State Univ., Col. of Forestry, Syracuse Univ., Bul. 41, 95 pp., illus.

(8) THORNBURY, WILLIAM D.
1954. PRINCIPLES OF GEOMORPHOLOGY. John Wiley and Sons, Inc., New York. 618 pp., illus.

(9) THORP, JAMES, and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Sci. 67: 117–126, illus.

(10) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook 18, 503 pp., illus.

(11) ———
1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. [Supplements issued in March 1967 and September 1968]

(12) UNITED STATES DEPARTMENT OF DEFENSE.
1968. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL–STD–619B, 30 pp., illus.

(13) UNIVERSITY OF THE STATE OF NEW YORK.
1962. GEOLOGICAL MAP OF NEW YORK (HUDSON-MOHAWK SHEET). New York State Museum and Science Service, Geol. Survey Map and Chart Series No. 5, Albany.

Glossary

Ablation, till. Material from within or on a glacier deposited as a result of glacial thinning or recession of the glacial ice front. These phenomena are caused mainly by melting and evaporation. Much of the clay and silt has been flushed out, leaving a coarse-textured till that is less compact and more permeable than basal till deposited largely by lodgment beneath glacial ice.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

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.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

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 and brittle; little affected by moistening.

Contrasting layer. A soil layer that is of a different geologic origin than the layer above it. This difference is not to be confused with differences caused by soil-forming processes.

Daylighting cut. A cut made in undisturbed land to obtain a lesser slope gradient than the original. It is commonly used to stabilize the surface.

Depth, soil. The depth of soil material over bedrock. The depths used in this survey are: *very shallow*, less than 10 inches; *shallow*, 10 to 20 inches; *moderately shallow* or *moderately deep*, 20 to 40 inches; and *deep*, more than 40 inches.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, 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 different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Drift (geology). Material of any sort deposited by geologic processes in one place after having been removed from another; includes drift materials deposited by glaciers and by streams and lakes associated with them.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of water-logging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Illite. The dominant type of clay mineral in the soils of New York State.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid,* and *very rapid.*

Proglacial deposits. Stream or lake deposits beyond the limits of the glacier ice front.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, from gravel; sandstone, from sand; shale, from clay; and limestone, from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sands have been consolidated into sandstone.

Shear key. A method of bonding earthfill against a natural slope. It uses vertical steps or keyways cut in the slope to increase bonding strength and resistance to sliding or shearing.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Substratum. Technically, the part of the soil below the solum.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

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."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Varves. Distinctly marked annual deposits of sediment, regardless of their origin.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

U.S. GOVERNMENT PRINTING OFFICE: 1975

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables as follows:

Estimated average yields per acre of specified field crops under two levels of management, table 1, page 24.
Suitability of the soils for woodland, table 2, page 28.
Suitability of the soils for wildlife habitat, table 3, page 34.
Engineering uses of the soils, tables 4, 5, and 6, pages 40 through 85.
Estimated degree and kind of limitation of the soils for town and country planning, table 7, page 90.
Approximate acreage and proportionate extent of the soils, table 8, page 106.

Map symbol	Mapping unit	Page	Capability unit		Woodland suitability group
			Symbol	Page	Number
Aa	Allis silt loam	107	IVw-2	21	5w1
Ad	Alluvial land	107	----	--	---
ApA	Appleton silt loam, 0 to 3 percent slopes	108	IIIw-1	18	3w1
ApB	Appleton silt loam, 3 to 8 percent slopes	108	IIIw-3	18	3w1
AtB	Appleton and Manheim very stony silt loams, 0 to 8 percent slopes	109	VIIs-4	23	3w1
BoB	Bombay very fine sandy loam, 3 to 8 percent slopes	109	IIe-4	13	2o1
BoC	Bombay very fine sandy loam, 8 to 15 percent slopes	110	IIIe-4	17	2o1
BrB	Broadalbin loam, 2 to 8 percent slopes	111	IIe-6	14	3o1
BrC	Broadalbin loam, 8 to 15 percent slopes	111	IIIe-3	16	3r1
BrD	Broadalbin loam, 15 to 25 percent slopes	111	IVe-3	20	3r2
BsD	Broadalbin and Lansing extremely stony soils, 0 to 25 percent slopes	111	VIIs-1	22	3x1
BuA	Burdett silt loam, 0 to 3 percent slopes	112	IIIw-1	18	3w1
BuB	Burdett silt loam, 3 to 8 percent slopes	113	IIIw-3	18	3w1
BuC	Burdett silt loam, 8 to 15 percent slopes	113	IIIe-6	17	3w1
CaB	Canton stony very fine sandy loam, 2 to 8 percent slopes	114	IIe-1	13	4o1
CaC	Canton stony very fine sandy loam, 8 to 15 percent slopes	114	IIIe-1	16	4o1
Cm	Carlisle muck	114	----	--	5w2
Co	Cohoctah mucky very fine sandy loam	115	VIw-1	22	5w2
CsB	Conesus silt loam, 2 to 8 percent slopes	116	IIe-4	13	2o1
Cu	Cut and fill land	116	----	--	---
FaC	Farmington silt loam, 0 to 8 percent slopes	117	IIIs-2	20	5d1
FcD	Farmington very rocky silt loam, 0 to 25 percent slopes	117	VIIs-3	23	5x1
FkE	Farmington-Rock land complex, steep	118	VIIs-3	23	5x2
Fr	Fredon fine sandy loam	118	IIIw-1	18	3w2
Fw	Fresh water marsh	118	VIIIw-1	23	---
Ha	Halsey soils	119	IVw-1	21	5w2
He	Hamlin fine sandy loam	120	I-2	13	2o1
Hf	Hamlin silt loam	120	I-2	13	2o1
HgB	Hartland-Agawam complex, 3 to 8 percent slopes	120	IIe-3	13	3o1
HgC	Hartland-Agawam complex, 8 to 15 percent slopes	121	IIIe-3	16	3r1
HgD	Hartland-Agawam complex, 15 to 25 percent slopes	121	IVe-3	20	3r2
HhA	Herkimer gravelly silt loam, 0 to 3 percent slopes	122	I-1	12	2o1
HhB	Herkimer gravelly silt loam, 3 to 8 percent slopes	122	IIe-7	14	2o1
HkB	Herkimer gravelly silt loam, moderately well drained, 0 to 4 percent slopes	122	IIw-1	15	2o1
HlB	Hilton silt loam, 3 to 8 percent slopes	123	IIe-4	13	2o1
HlC	Hilton silt loam, 8 to 15 percent slopes	123	IIIe-4	17	2o1
HmA	Hinckley gravelly loamy sand, 0 to 3 percent slopes	124	IVs-1	21	5s1
HmB	Hinckley gravelly loamy sand, 3 to 8 percent slopes	124	IVs-1	21	5s1
HmC	Hinckley gravelly loamy sand, 8 to 15 percent slopes	125	VIIs-2	22	5s1
HnD	Hinckley and Windsor soils, 15 to 25 percent slopes	125	VIIs-2	22	5s2
HnF	Hinckley and Windsor soils, 25 to 70 percent slopes	125	VIIe-1	22	5s3
HoB	Honeoye silt loam, 3 to 8 percent slopes	126	IIe-1	13	2o1

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page	Woodland suitability group Number
HoC	Honeoye silt loam, 8 to 15 percent slopes	126	IIIe-1	16	2o1
HoD	Honeoye silt loam, 15 to 25 percent slopes	126	IVe-1	20	2r1
HrE	Honeoye and Lansing silt loams, 25 to 35 percent slopes	126	VIe-1	22	2r1
HsD	Honeoye and Mohawk very stony silt loams, 0 to 25 percent slopes	126	VIs-1	22	2r1
HtA	Hornell silt loam, 0 to 3 percent slopes	127	IIIw-2	18	3w3
HtB	Hornell silt loam, 3 to 8 percent slopes	127	IIIw-4	19	3w3
HtC	Hornell silt loam, 8 to 15 percent slopes	127	IIIe-6	17	3w4
HuA	Howard gravelly fine sandy loam, 0 to 3 percent slopes	129	IIs-1	15	2o2
HuB	Howard gravelly fine sandy loam, 3 to 8 percent slopes	129	IIs-1	15	2o2
HuC	Howard gravelly fine sandy loam, 8 to 15 percent slopes	129	IIIe-2	16	2o2
HvA	Howard gravelly silt loam, 0 to 3 percent slopes	129	IIs-1	15	2o2
HvB	Howard gravelly silt loam, 3 to 8 percent slopes	129	IIs-1	15	2o2
HvC	Howard gravelly silt loam, 8 to 15 percent slopes	129	IIIe-2	16	2o2
HwD	Howard and Palmyra soils, 15 to 25 percent slopes	129	IVe-1	20	2r2
HyB	Hudson silt loam, loamy substratum, 2 to 8 percent slopes	130	IIe-5	14	2o1
HyC	Hudson silt loam, loamy substratum, 8 to 15 percent slopes	130	IIIe-5	17	2r3
HyD	Hudson silt loam, loamy substratum, 15 to 30 percent slopes	131	IVe-4	21	2r4
In	Ilion silt loam	132	IVw-1	21	4w1
Is	Ilion and Sun very stony silt loams	132	VIIs-4	23	4w1
LaB	Lairdsville silt loam, loamy subsoil variant, 3 to 8 percent slopes	133	IIe-5	14	3o1
LaC	Lairdsville silt loam, loamy subsoil variant, 8 to 15 percent slopes	133	IIIe-5	17	3r1
LaD	Lairdsville silt loam, loamy subsoil variant, 15 to 25 percent slopes	133	IVe-4	21	3r2
Lk	Lamson mucky silt loam	134	IVw-1	21	4w1
LnC	Lansing silt loam, 8 to 15 percent slopes	135	IIIe-1	16	2o1
LnD	Lansing silt loam, 15 to 25 percent slopes	135	IVe-1	20	2r1
LoA	Lima silt loam, 0 to 3 percent slopes	136	IIw-1	15	2o1
LoB	Lima silt loam, 3 to 8 percent slopes	136	IIe-4	13	2o1
LoC	Lima silt loam, 8 to 15 percent slopes	136	IIIe-4	17	2o1
LpB	Lockport silt loam, loamy subsoil variant, 0 to 4 percent slopes	137	IIIw-2	18	3w3
Ly	Lyons mucky silt loam	138	IVw-1	21	4w1
McA	Manheim silt loam, 0 to 3 percent slopes	139	IIIw-1	18	3w1
McB	Manheim silt loam, 3 to 8 percent slopes	139	IIIw-3	18	3w1
McC	Manheim silt loam, 8 to 15 percent slopes	139	IIIe-6	17	3w1
MlB	Manlius shaly silt loam, 3 to 8 percent slopes	140	IIe-2	13	3o1
MlC	Manlius shaly silt loam, 8 to 15 percent slopes	141	IIIe-7	17	3o1
MlD	Manlius shaly silt loam, 15 to 25 percent slopes	141	IVe-5	21	3r1
MnB	Massena very fine sandy loam, 0 to 8 percent slopes	142	IIIw-3	18	3w2
MoB	Mohawk silt loam, shale substratum, 3 to 8 percent slopes	142	IIe-1	13	2o1
MoC	Mohawk silt loam, shale substratum, 8 to 15 percent slopes	143	IIIe-1	16	2o1
MoD	Mohawk silt loam, shale substratum, 15 to 25 percent slopes	143	IVe-1	20	2r1
MsB	Mosherville very fine sandy loam, 2 to 8 percent slopes	144	IIIw-5	19	3w3
NaB	Nassau silt loam, 3 to 8 percent slopes	144	IIIs-2	20	4d1
NaC	Nassau silt loam, 8 to 15 percent slopes	145	IVe-5	21	4d1
NaD	Nassau silt loam, 15 to 25 percent slopes	145	IVe-5	21	4x1
OnB	Ontario silt loam, 3 to 8 percent slopes	146	IIe-1	13	2o1
OnC	Ontario silt loam, 8 to 15 percent slopes	146	IIIe-1	16	2o1
OnD	Ontario silt loam, 15 to 25 percent slopes	146	IVe-1	20	2r1
PaB	Palatine silt loam, 2 to 8 percent slopes	147	IIe-1	13	2o1
PaC	Palatine silt loam, 8 to 15 percent slopes	147	IIIe-1	16	2o1
PaD	Palatine silt loam 15 to 25 percent slopes	147	IVe-1	20	2r5
Pk	Palms muck	148	----	--	4w1
PlA	Palmyra gravelly silt loam, 0 to 3 percent slopes	148	I-1	12	2o1

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page	Woodland suitability group Number
PlB	Palmyra gravelly silt loam, 3 to 8 percent slopes	149	IIe-7	14	2o1
PlC	Palmyra gravelly silt loam, 8 to 15 percent slopes	149	IIIe-2	16	2o1
PmC	Palmyra and Howard soils, rolling	149	IVe-2	20	2o1
PmF	Palmyra and Howard soils, 25 to 70 percent slopes	149	VIIe-1	22	2r2
PpB	Phelps gravelly fine sandy loam, 0 to 4 percent slopes	150	IIw-1	15	2o1
RaB	Raynham silt loam, 0 to 4 percent slopes	151	IIIw-1	18	4w1
RbA	Rhinebeck silt loam, loamy substratum, 0 to 3 percent slopes	152	IIIw-2	18	3w1
RbB	Rhinebeck silt loam, loamy substratum, 3 to 8 percent slopes	152	IIIw-4	19	3w1
Ro	Rough broken land	152	-----	--	---
Sa	Sandstone rock land	152	-----	--	---
ShF	Shaly rock land, very steep	152	-----	--	---
Sm	Sun mucky silt loam	153	IVw-1	21	4w1
Te	Teel fine sandy loam	154	IIw-2	15	2o1
Ts	Teel silt loam	154	IIw-2	15	2o1
WaA	Wassaic silt loam, 0 to 3 percent slopes	155	IIs-2	15	2o1
WaB	Wassaic silt loam, 3 to 8 percent slopes	155	IIe-1	13	2o1
WaC	Wassaic silt loam, 8 to 15 percent slopes	155	IIIe-1	16	2o1
WaD	Wassaic silt loam, 15 to 25 percent slopes	155	IVe-1	20	2r1
Wd	Wayland silt loam	156	IIIw-6	19	4w1
WlA	Williamson silt loam, 0 to 3 percent slopes	157	IIw-1	15	2o1
WlB	Williamson silt loam, 3 to 8 percent slopes	157	IIe-6	14	2o1
WnA	Windsor loamy fine sand, 0 to 3 percent slopes	158	IIIs-1	19	5s1
WnB	Windsor loamy fine sand, 3 to 8 percent slopes	158	IIIs-1	19	5s1
WnC	Windsor loamy fine sand, 8 to 15 percent slopes	158	IVs-1	21	5s1

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457–3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers. If you believe you experienced discrimination when obtaining services from USDA, participating in a USDA program, or participating in a program that receives financial assistance from USDA, you may file a complaint with USDA. Information about how to file a discrimination complaint is available from the Office of the Assistant Secretary for Civil Rights. USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex (including gender identity and expression), marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.)

To file a complaint of discrimination, complete, sign, and mail a program discrimination complaint form, available at any USDA office location or online at www.ascr.usda.gov, or write to:

USDA
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, S.W.
Washington, DC 20250-9410

Or call toll free at (866) 632-9992 (voice) to obtain additional information, the appropriate office or to request documents. Individuals who are deaf, hard of hearing, or have speech disabilities may contact USDA through the Federal Relay service at (800) 877-8339 or (800) 845-6136 (in Spanish). USDA is an equal opportunity provider, employer, and lender.

Persons with disabilities who require alternative means for communication of program information (e.g., Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).