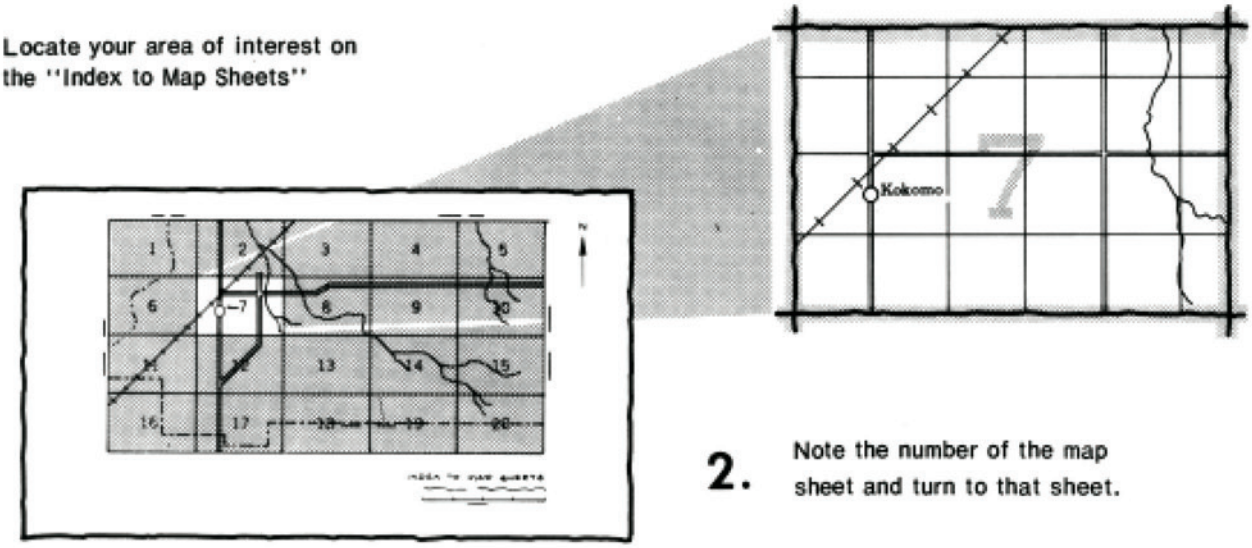
Soil Survey of Orange County, New York

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

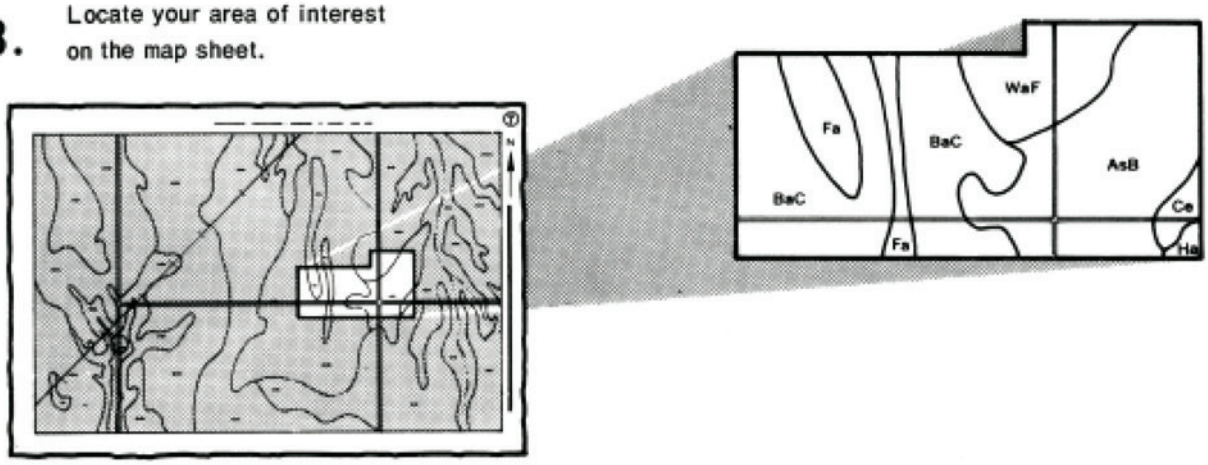
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

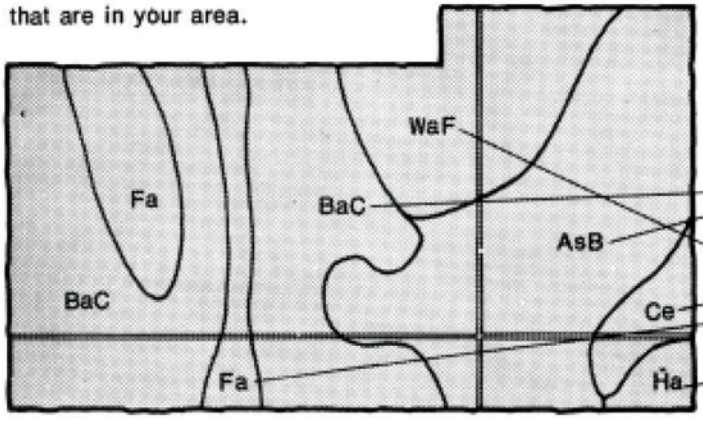


2. Note the number of the map sheet and turn to that sheet.

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



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



Symbols

AsB
BaC
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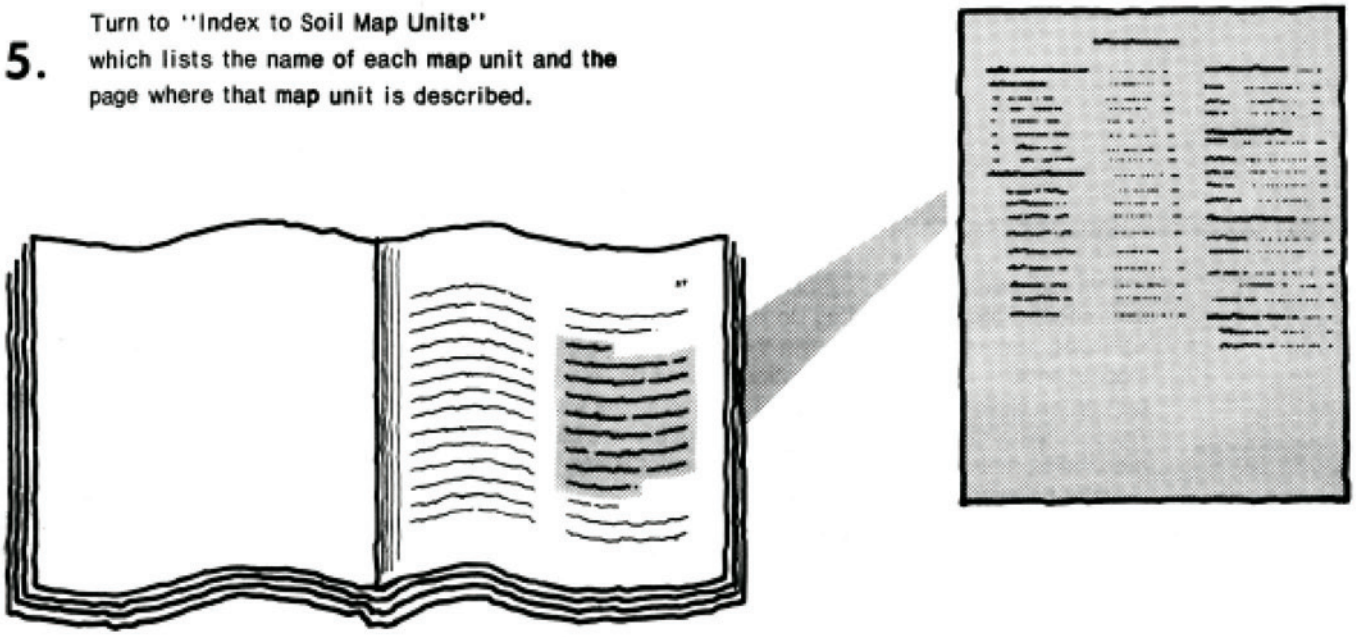
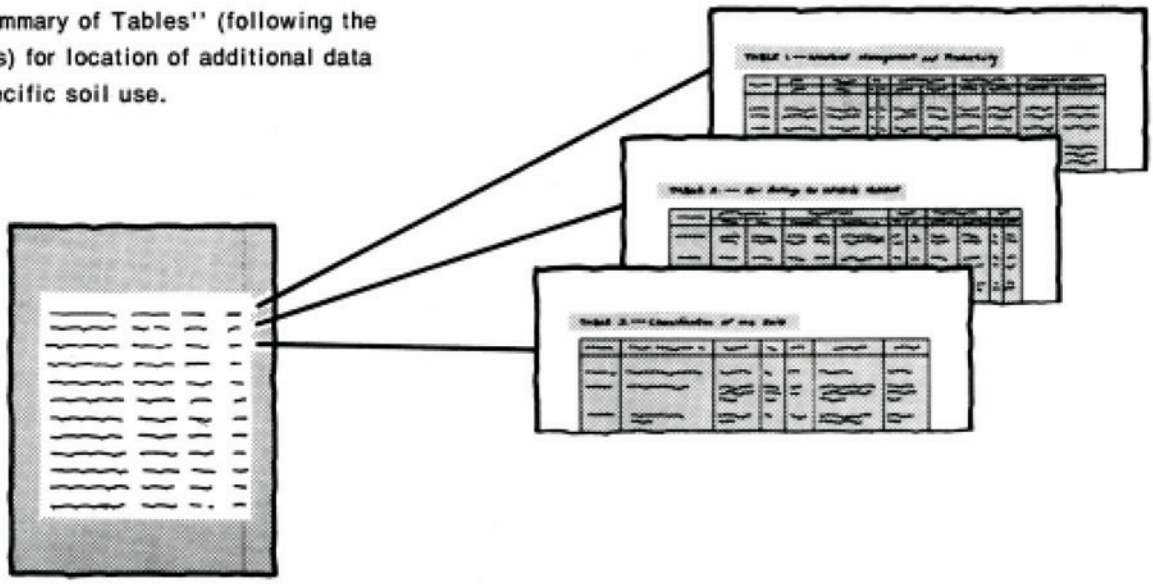
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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

Major fieldwork for this soil survey was performed in the period 1971-74. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service and the Cornell University Agricultural Experiment Station. The New York State Department of Transportation also assisted with the survey. The survey is part of the technical assistance furnished to the Orange County Soil and Water Conservation District. Partial funding of the survey was provided by the Orange County Legislature through the Orange County Soil and Water Conservation District.

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

Cover: Typical land use pattern on the extensive Mardin-Erie soils in the central part of Orange County. Hayland and pasture are intermingled with wooded areas.

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Issued October 1981

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Foreword

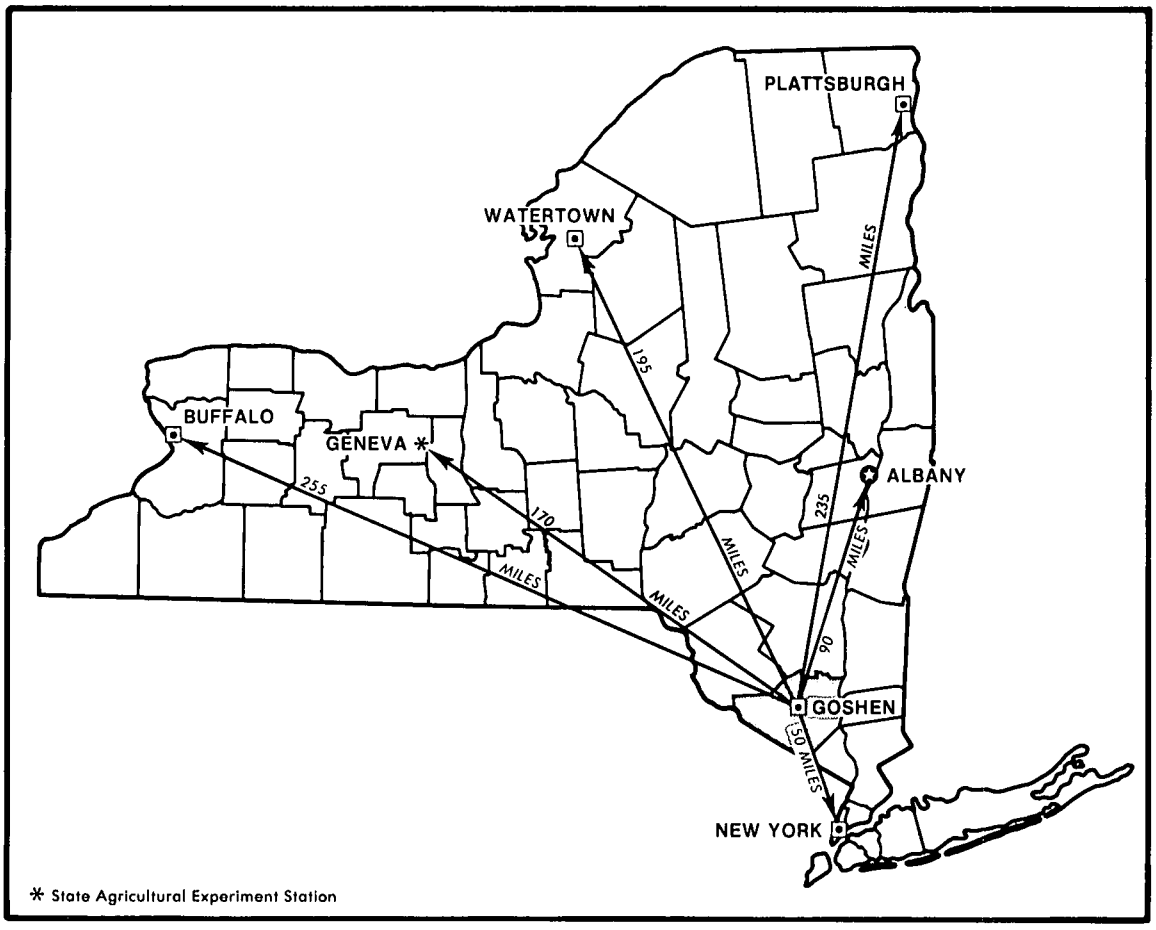
This soil survey contains information that can be used in land-planning programs in Orange County, New York. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the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

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

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L. Hilliard
State Conservationist
Soil Conservation Service



Location of Orange County in New York.

Soil Survey of Orange County, New York

By Karl S. Olsson, Soil Conservation Service

Fieldwork by Stefan T. Seifried, Fred D. Holman, Willie L. Pittman, Burton R. Laux, and Karl S. Olsson, Soil Conservation Service

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

ORANGE COUNTY, on the west side of the Hudson River in the southwest corner of New York State, is approximately 35 miles northwest of New York City. East of the Hudson River are Dutchess County and Putnam County. To the north of Orange County is Ulster County and to the northwest is Sullivan County. To the southwest are Sussex County and Passaic County, New Jersey, and the Delaware River. West of the river is Pike County, Pennsylvania.

The county, which is roughly triangular, has an east-west dimension of 38 miles between the Hudson River and the Delaware River. It has a total area of 829 square miles, or 530,560 acres. Goshen is the county seat.

According to the 1974 Census of Agriculture, about 28 percent of the land area of the county is in farms (*13*). Of this area about 45 percent is in crops, 25 percent is in pasture, and 20 percent is farm woodlots.

Land use changed during the period from 1959 to 1974. A large acreage that was farmed in 1959 is now out of production. Much of it is idle. A considerable acreage, particularly in the central and southeastern regions, has been taken over for urban development.

Although still extensive, dairy farming decreased considerably during this period.

High value crops are grown on a large acreage of drained organic soils along the Wallkill River and Cromline Creek. This "black dirt" area, as it is termed locally, produces crops such as onions, celery, and lettuce and sod for lawns.

Large stud and race horse farms are located in the northern part of the county. Apple orchards are along the Hudson River in the northeast.

Large forested areas are in the southeastern and southwestern parts of the county where the terrain is very rough and steep. Many wooded areas have been cut over several times for lumber.

General nature of the survey area

On his upriver voyage in 1609 (*8*), Henry Hudson, an English explorer, was the first European to see the area now called Orange County. The Indians he met in the area were the Minisinks, a division of the Muncee tribe, in turn a part of the Delaware (Lenni-Lenape) tribe. In the 17th and 18th centuries their numbers rapidly declined.

Orange County's first white settler was Colonel Patrick MacGrogorie, a Scotsman, who built a cabin at Plum Point on the New Windsor-Cornwall town line in 1685.

One of the first major settlements, Newburgh, was settled according to the German Patent issued by Queen Ann in 1719. The German Patent set a pattern for other ethnic groups. French Huguenots, for example, migrated up the Wallkill River Valley and settled around Cuddebackville and Montgomery. In the last years of the 19th century, Italian, German, Swiss, and Polish immigrants started their own communities in the "black dirt" area around Pine Island.

The population in Orange County has increased rapidly in the last 30 years because of the decline in agriculture and the increase in urban development. In 1940, the population was approximately 150,000; in 1974 it was 262,000 (*8*). Projected growth figures indicate that the population will continue to increase into the 21st century.

Industry and transportation

The earliest industries in the county were iron mines, refineries, and foundries; powderworks; and leatherworks. In recent years industrial build-up has taken place in the Middletown, Warwick, and Harriman areas of Orange County. Industries are centered around food, metal, paper, chemicals, crushed stone, textiles, and apparel products. Many small industries making miscellaneous products, such as Christmas lights, fishing rods and tackle, plastic products, and signs, are established throughout the county.

The railroad played a major role in industrial development. In 1843, the Erie Railroad laid track between Middletown and Port Jervis. Today the area is serviced by several lines of the Conrail system. Bus lines serving Orange County are the Adirondack Trailway, Newburgh-Beacon, and Short Line. Numerous motor freight companies move freight and supplies to and from New York City and other parts of the country.

Physiography and geology

Bernard S. Ellis, senior staff geologist, Soil Conservation Service, helped prepare this section.

The central part of Orange County is within the Hudson Mohawk Lowland. Shawangunk Mountain extends across the western part, and the west corner of the county is in the Catskill Mountains. The Ramapo Mountains and the Hudson Highlands, a part of the New England Upland physiographic province, occupy the eastern third.

Bellvale, Warwick, and Schunemunk Mountains, in the eastern part, provide dramatic topographic relief. In the western part, Shawangunk Mountain provides spectacular vistas at many locations. The central part of the county is gently rolling. Several large areas of glacial lake deposits are almost flat.

Elevations range from sea level at the west bank of the Hudson River to 1,664 feet at the top of Schunemunk Mountain, southwest of Newburgh. Relief of 500 to 600 feet is common in the west. At the east end of the county, relief of 1,000 feet occurs within a very short distance. In the broad central area of the county, 150 feet is about the maximum that occurs within any reasonable distance.

The bedrock geology of Orange County is fairly complex (*3*).

The central part is the least variable. The Trenton Group of shales underlies the entire area. The Snake Hill Shale of Ordovician age is mapped as the principal member of this group.

The west edge of the county is dominated by the Shawangunk Formation. These Silurian age sandstones and conglomerates jut up in a narrow band along the east edge of the Neversink River Valley.

The eastern third of the county is a complex of folded and faulted rocks ranging from Pre-Cambrian to Triassic. Metamorphic rock predominates in this area, but many other basic types also occur.

Orange County was moderately affected by glaciation. Advance and retreat of the ice modified topography and soils. Researchers currently estimate that this ice age started some 300,000 years ago and that the last retreat of the ice occurred about 12,000 years ago (*5*).

Ice advances tended to smooth out the ground surface and often deepened valleys that were oriented in the direction of the advance.

Glacial till, the dominant overburden material in the county, also called ground moraine, was generally deposited directly from the bottom of the glacial ice. It occupies approximately 86 percent of the land surface. The widespread occurrence of this till can partly be explained by the fact that it was deposited during both the advance and retreat of the ice. Erie, Swartswood, Lordstown, Arnot, and Nassau soils formed in this till.

Melting ice produced torrents of water in some locations. The dominant material deposited by this flow of water was sand and gravel. Hoosic and Otisville soils formed in these glaciofluvial deposits. Water from the melting ice ponded in many locations, resulting in the deposition of finer material. Collamer and Rhinebeck soils formed in these lacustrine deposits, which are well disseminated throughout the county. These fluvial and lacustrine deposits occupy approximately 9 percent of the land area.

In the many shallow water and semiswamp areas during the waning stages of glaciation, vegetation grew rapidly and formed deposits of organic material when it decayed. The largest deposit is in the vicinity of Durlandville and Pine Island. There are approximately 50 other small deposits. Palms and Carlisle soils formed in these organic deposits, which make up approximately 3 percent of the land area.

The action of running water in present day streams accounts for most of the deposits that have a modern or recent classification. These deposits, generally labeled alluvium, occupy 2 percent of the land area. Tioga and Wayland soils formed in alluvium.

Bedrock is exposed in both the eastern and western parts of the county.

Drainage

The major drainage in Orange County is oriented in a northeast-southwest direction.

In the western part of the county, the Neversink River flows southward along the Shawangunk Mountains and empties into the Delaware River at Port Jervis.

In the eastern part, Woodbury and Moodna Creeks are the principal drainageways. Flowing northerly and easterly, they empty into the Hudson River south of Newburgh.

The Wallkill River drains the central part of the county. It rises in New Jersey, enters Orange County just east of Unionville and flows northeasterly to the Hudson River at Kingston, New York. The Wallkill drains the largest single muck deposit in the county.

Gradients are fairly low in the central part of the county. Fairly low gradients are also characteristic of the major drainageways in the eastern and western parts. The tributaries, however, are fairly steep in most areas because the steeply folded bedrock is relatively resistant to erosion.

Water supply

Ground water and surface water are the two main sources of water for industrial, municipal, and residential use.

The largest source of surface water is the Hudson River, which forms the eastern boundary of the county. All cities in the county obtain water from reservoirs that are impounded behind dams on the smaller streams.

The major valleys, with the exception of the Wallkill River Valley, generally contain thick deposits of sand and gravel that are excellent sources of ground water (*6*). The other major source of ground water is in the fractures of bedrock. Wells in the bedrock yield adequate supplies for residential use. In the fault zones in the southeastern part of the county, wells have high yields because of the porosity of the rock.

In general the quality of both surface and ground water is good. Occasionally, the surface water supply is exposed to contamination, but contamination is not a major problem. Hardness of the ground water, depending on the aquifer, can be a nuisance in some areas.

Climate

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

Winters are cold in Orange County. Summers are moderately warm with occasional hot spells. The mountains are markedly cooler than the main agricultural areas in the lowlands. Precipitation is well distributed throughout the year and is nearly always adequate for all crops. Winter snows occur frequently, occasionally as blizzards.

Table 1 gives data on temperature and precipitation for the survey area as recorded at West Point, New York, in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 29 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at West Point on February 8, 1963, is -11 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on September 2, 1953, is 105 degrees.

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

The total annual precipitation is 48 inches. Of this, 24 inches, or 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 4.76 inches at West Point on September 12, 1960. Thunderstorms occur on about 31 days each year, and most occur in summer.

Average seasonal snowfall is 43 inches. The greatest snow depth at any one time during the period of record was 40 inches. On an average of 25 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 10 miles per hour, in April.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated

on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

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

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

The general soil map units in Orange County are described on the following pages. The terms denoting texture in the legend for each unit apply to the surface layer of the major soils. The terms denoting drainage class also apply only to the major soils. Some units include soils that are less sloping or more sloping than the legend suggests. The text indicates the range of slope within the unit.

General soil maps have been published for four counties adjacent to Orange County: Ulster County, New York; Sussex and Passaic Counties, New Jersey; and Pike County, Pennsylvania. In some areas the names of adjoining map units are not exactly the same because proportions of major soils differ from one survey area to another. Also, the concepts and names of some soil series have changed as a result of changes in the taxonomic system since the publication of those earlier surveys. In a few areas the matching of adjoining units is not perfect because of differences in the scale of mapping.

Descriptions of map units

1. Mardin-Erie

Dominantly gently sloping and sloping, deep, moderately well drained and somewhat poorly drained, medium textured soils; on uplands

The soils in this unit formed in glacial till deposits. The landscape is one of hilltops, hillsides, and broad divides. The slope is mainly 3 to 15 percent but ranges from 0 to 35 percent.

This unit, the largest in the county, makes up about 45 percent of the land area. It is about 50 percent Mardin soils, 15 percent Erie soils, and 35 percent soils of minor extent.

Mardin and Erie soils formed in similar glacial till deposits derived from shale, slate, and sandstone.

The gently sloping to steep Mardin soils are on hilltops, hillsides, ridges, and knolls. They are deep, are moderately well drained, and have a fragipan. The water table is perched above the pan for brief periods in spring. The rate of water movement is moderate through the surface layer and the upper part of the subsoil but is slow or very slow in the fragipan and substratum. The dense pan, which begins 14 to 25 inches below the surface, restricts roots. In some areas large stones and boulders are on the surface.

The nearly level and gently sloping Erie soils are on concave foot slopes, on broad flats, and along drainageways. In most areas they receive runoff from higher adjacent soils. They are deep, are somewhat poorly drained, and have a fragipan. The water table is perched above the pan in spring and other wet periods. The rate of water movement is moderate through the surface layer and the upper part of the subsoil but is slow or very slow in the fragipan and substratum. The dense fragipan, which begins 10 to 24 inches below the surface, restricts roots. In some areas large stones and boulders are on the surface.

Of minor extent in this unit are Bath, Alden, Arnot, Nassau, Lordstown, Raynham, Canandaigua, Chenango, and Middlebury soils and a few areas of Rock outcrop. The well drained Bath soils are similar to Mardin soils but occur on higher, better drained ridges and knolls. The very poorly drained Alden soils are in depressions in the lowest parts of the landscape. The somewhat excessively drained to moderately well drained Arnot soils are in a few areas where sandstone bedrock is only 10 to 20 inches below the surface. The somewhat excessively drained Nassau soils are in areas where shale bedrock is 10 to 20 inches below the surface. The well drained Lordstown soils occur in areas where bedrock is 20 to 40 inches below the surface. The somewhat poorly drained to poorly drained Raynham soils and poorly drained and very poorly drained Canandaigua soils are in low areas of stone-free, silty glacial lake deposits. The somewhat excessively drained to well drained Chenango soils are on a few gravelly outwash terraces, mostly in valleys. The moderately well drained to somewhat poorly drained Middlebury soils occur on flood plains along a few major streams that traverse this unit.

Most areas are farmed. Some are wooded. Others are idle or are used for community development. Dairying and raising horses and beef cattle are the principal farm enterprises. Drainage and erosion control are the main management requirements for optimum crop production. Seasonal wetness and slow or very slow water move-

ment through the fragipan are limitations for community development.

2. Swartswood-Alden

Dominantly nearly level to sloping, deep, well drained, moderately well drained, and very poorly drained, very stony, medium textured soils; on uplands

These soils formed in glacial till deposits. The landscape is mainly one of ridges, rolling hillsides, and hilltops interspersed with lower flats. The slope is mostly 0 to 15 percent but ranges from 0 to 45 percent.

This unit makes up about 4 percent of the county. It is about 45 percent Swartswood soils, 20 percent Alden soils, and 35 percent soils of minor extent.

Swartswood soils formed in glacial till deposits derived from conglomerate and sandstone. These gently sloping to very steep soils are on ridges, convex hilltops, and hillsides. They are deep, are well drained to moderately well drained, and have a fragipan. The water table is perched above the pan for very brief periods early in spring. The surface layer is medium in texture, and the subsoil is moderately coarse. The rate of water movement is moderate or moderately rapid through the surface layer and the upper part of the subsoil but is slow or moderately slow in the fragipan and substratum. The dense fragipan, which begins 25 to 35 inches below the surface, restricts roots. In most areas stones and boulders are about 5 to 30 feet apart on the surface.

Alden soils formed in glacial till deposits derived from sandstone and shale. In many areas they have a mantle of silty colluvial material, a result of local in-wash from surrounding higher soils. These nearly level soils are in depressions and low flats that receive a considerable amount of runoff from higher adjacent soils. They are deep, are very poorly drained, and are medium textured in the surface layer and subsoil. The rate of water movement is moderate through the surface layer and is moderately slow in the subsoil and substratum. The water table is perched at the surface or just below the surface for prolonged periods. In many areas stones and boulders are on the surface.

Of minor extent in this unit are Wurtsboro, Mardin, Erie, Lordstown, Arnot, Basher, Canandaigua, Palms, and Carlisle soils. Swartswood soils and the somewhat poorly drained to moderately well drained Wurtsboro soils formed in similar parent material. Wurtsboro soils occur on many foot slopes and in many concave areas that receive runoff. The moderately well drained Mardin soils and somewhat poorly drained Erie soils are in a few areas where the silt content is higher than in Swartswood soils. The well drained, moderately deep Lordstown soils and somewhat excessively drained, shallow Arnot soils are in areas where bedrock is near the surface. The moderately well drained to somewhat poorly drained Basher soils are along a few streams that cross the unit. The poorly drained and very poorly drained Canandaigua soils are in depressions and on low flats containing silty lake-laid deposits that are free of rock fragments. The very poorly drained Palms and Carlisle soils occupy a few large, very low depressions containing well decomposed organic deposits. Carlisle soils are generally at the center of the depressions, and Palms soils are around the margins.

Most of this unit is wooded and is used for wildlife habitat or recreation. A few areas are used to a very limited extent for community development. Most areas are not well suited to farming because of the large number of stones and boulders on the surface and the scattered pockets of very wet soils. Slow or moderately slow water movement through the fragipan in the Swartswood soils, prolonged wetness in the Alden soils, and the very stony surface in both soils are limitations for most community development. Some areas provide an excellent opportunity for improving wildlife habitat.

3. Pittsfield-Farmington

Dominantly gently sloping and sloping, well drained and somewhat excessively drained, medium textured soils that are deep and shallow over limestone; on uplands

These soils formed in deep and shallow glacial till deposits. The landscape is one of broad hilltops, ridges, knolls, and hillsides underlain with limestone bedrock. The slope is mainly 3 to 15 percent but ranges from 3 to 25 percent.

This unit makes up about 5 percent of the county. It is about 45 percent Pittsfield soils, 15 percent Farmington soils, and 40 percent soils of minor extent.

Pittsfield and Farmington soils formed in similar glacial till deposits derived principally from limestone and a lesser component of schist or shale and sandstone.

The gently sloping to moderately steep Pittsfield soils are on convex hilltops, hillsides, and ridges that receive little or no runoff from adjacent ridges. They are deep, well drained, and dominantly medium textured. The substratum is dominantly moderately coarse textured. Bedrock is below 5 feet. The rate of water movement is moderately rapid through the surface layer and subsoil and is moderate or moderately rapid through the substratum. Depth to the water table is generally more than 6 feet.

The sloping to hilly Farmington soils are on hilltops, hillcrests, ridges, and knolls. They are shallow, well drained to somewhat excessively drained, and medium textured. Bedrock, generally limestone, is at a depth of 10 to 20 inches. The rate of water movement is moderate.

Of minor extent in this unit are the Hollis, Lordstown, Swartswood, Alden, Scio, Hoosic, and Palms soils, some areas of Rock outcrop intermingled with the shallow Farmington soils, numerous areas of a soil that is similar to Farmington soils but is 20 to 40 inches thick over bedrock and is less acid than Lordstown soils, and, in the town of Montgomery, a soil that is similar to Pittsfield soils but contains more shale fragments and is less acid.

Well drained to somewhat excessively drained Hollis soils are similar to Farmington soils but are underlain by granite, schist, or gneiss. Well drained Lordstown soils are in some areas where bedrock is 20 to 40 inches below the soil surface. Well drained to moderately well drained Swartswood soils, which are on a few ridges, have a fragipan. Very poorly drained Alden soils are in low, nearly level areas. Moderately well drained Scio soils occupy some gravelly outwash terraces capped with a thick mantle of silty deposits. Somewhat excessively drained Hoosic soils are on a few very gravelly knolls and ridges. Very poorly drained Palms soils are in small depressions that contain decomposed organic deposits.

Many areas of this unit are used for farming. Some areas, particularly those dominated by Farmington soils and a few outcrops of rock, are wooded, idle, or pastured. Several areas have been developed for urban uses and recreation. The farmed areas are mainly dairy farms or orchards. The deep Pittsfield soils are suited to row crops, small grain, and hay. Farmington soils tend to be droughty and difficult to till because they are shallow over bedrock.

Pittsfield soils are suitable for community development, but the shallow Farmington soils have serious limitations. Pollution of the underground water supply is a hazard in developed areas where limestone bedrock is close to the surface.

4. Nassau-Bath-Rock outcrop

Dominantly gently sloping to hilly, somewhat excessively drained and well drained, medium textured soils that are shallow and deep over shale; and Rock outcrop; on uplands

These soils formed in shallow and deep shaly glacial till deposits. The landscape is a series of ridges, knolls, and low hills. The topography is complex and sloping, as a result of the folded shale and slate bedrock. In many places the tilted bedrock is exposed. The slope is mainly 3 to 25 percent but ranges from 3 to 45 percent.

This unit makes up about 8 percent of the county. It is about 30 percent Nassau soils, 25 percent Bath soils, 15 percent Rock outcrop, and 30 percent soils of minor extent.

Nassau and Bath soils formed in similar glacial till deposits derived mainly from shale and slate.

The gently sloping to very steep Nassau soils are on the sides and tops of hills and ridges. They are shallow and are somewhat excessively drained. Tilted bedrock is at a depth of 10 to 20 inches. The rate of water movement is moderate through the soil.

The gently sloping and sloping Bath soils are on convex interridge areas where the bedrock is at a greater depth than under Nassau soils. They are deep and well drained. They have a fragipan. Bedrock is commonly at a depth of 48 to 60 inches. The rate of water movement is moderate through the surface layer and the upper part of the subsoil and is slow or very slow in the fragipan and substratum. The pan, which begins at a depth of 26 to 40 inches, restricts roots. A seasonal high water table is perched above the pan for very brief periods early in spring.

Exposures of tilted and folded shale and slate bedrock are common along ridge crests and on the tops of low knolls and hills.

Of minor extent in this unit are Mardin, Erie, Alden, Hollis, Chenango, and Palms soils and a soil that is similar to Nassau but is 20 to 48 inches deep over bedrock. The moderately well drained Mardin soils and somewhat poorly drained Erie soils formed in the same kind of deposits as the Bath soils but occur in lower parts of the landscape that receive runoff from higher adjacent soils. The very poorly drained Alden soils occupy concave flats and depressions. The well drained to somewhat excessively drained Hollis soils are in areas where the underlying bedrock is dominantly granite, schist, or gneiss. Well drained to somewhat excessively drained Chenango soils occupy a few gravelly outwash ridges and terraces. The very poorly drained Palms muck is in a few bogs and swamps.

Some areas are farmed. Others are idle or wooded. Generally this unit is better suited to pasture, hay, and orchards than to cultivated crops. The irregular topography and areas of Rock outcrop are serious limitations for cultivated crops. Row crops can be grown in some interridge areas that are dominantly Bath soils. Because of the variable depth to bedrock, available water capacity varies considerably within short distances.

The shallowness over bedrock in Nassau soils and the dense fragipan in Bath soils limit the use of these soils for community development. Some areas have good potential for recreation.

5. Arnot-Swartswood-Hollis

Dominantly sloping, somewhat excessively drained to moderately well drained, medium textured soils that are shallow and deep over sandstone or gneiss and schist; on uplands

This unit consists of shallow and deep soils that formed in glacial till deposits. The landscape is one of hilltops, hillsides, valley sides, and ridges in uplands where the relief has been influenced by the underlying bedrock. Bedrock is mainly sandstone, shale, schist, or gneiss. Many areas have a stairstep appearance where the underlying bedrock is horizontally bedded. The slope is dominantly 8 to 15 percent but ranges from 3 to 60 percent.

This unit makes up about 10 percent of the county. It is about 20 percent Arnot soils, 20 percent Swartswood soils, 20 percent Hollis soils, and 40 percent soils of minor extent.

The sloping to very steep Arnot soils are on the sides and tops of hills and ridges and along some valley sides. They formed in a mantle of glacial till 10 to 20 inches

thick over hard sandstone or shale bedrock. They are shallow and are somewhat excessively drained to moderately well drained. They have a high content of channery and gravel fragments. The rate of water movement is moderate through the soil. Where the bedrock is poorly jointed and fractured, a seasonal high water table is perched above the rock for brief periods in spring. In midsummer, droughtiness is a hazard.

The gently sloping to moderately steep Swartswood soils are on convex inter-ridge areas and on hilltops and hillsides where the soil mantle is deeper over the underlying bedrock. They formed in glacial till deposits derived from sandstone and conglomerate. They are deep and are well drained and moderately well drained. They have a fragipan at a depth of 35 inches. They are medium textured in the surface layer and moderately coarse textured in the subsoil. Thickness of the soil mantle is greater than 5 feet. The rate of water movement is moderate through the surface layer and upper part of the subsoil and moderately slow or slow in the fragipan and substratum. The pan restricts root penetration and water movement. The water table is perched above the pan for brief periods in spring. In some areas, large stones and boulders are on the surface.

The sloping to very steep Hollis soils are on hills, ridges, and valley side slopes where the relief has been influenced by the underlying bedrock. They formed in a 10- to 20-inch mantle of glacial till over hard schist, gneiss, and granitic bedrock. They are shallow and are well drained to somewhat excessively drained. The rate of water movement is moderate or moderately rapid through the soil. Generally no free water is perched above the rock.

Of minor extent in this unit are Lordstown, Mardin, Wurtsboro, Charlton, Alden, Nassau, Otisville, and Middlebury soils and some Rock outcrop. The well drained Lordstown soils occur in many areas where bedrock is at a depth of 20 to 40 inches. The moderately well drained Mardin soils are similar to Swartswood soils but occur in areas where there is a higher silt content in the subsoil. The moderately well drained and somewhat poorly drained Wurtsboro soils are associated with Swartswood soils on lower side slopes, along drainageways, and in other areas where some runoff is received from higher adjacent soils. The well drained Charlton soils are associated with Hollis soils in a few areas where the soil is deep and does not have a fragipan. The very poorly drained Alden soils are in a few depressions and nearly level concave areas. The somewhat excessively drained Nassau soils are in a few areas that are underlain by tilted and folded shale bedrock. The excessively drained Otisville soils are on a few gravelly outwash terraces, ridges, and low rounded knolls. The moderately well drained to somewhat poorly drained Middlebury soils occur on flood plains along a few streams that traverse this unit.

Many areas of this unit are wooded and provide habitat for wildlife (fig. 1). Some areas are idle. Others are pastured. Shallowness over bedrock and droughtiness in some soils and restricted water movement through the fragipan in the deep soils are the main limitations for farming and community development. Slope is also a limitation in many areas. The gently sloping and sloping areas of Swartswood soils are suited to cultivated crops. Some areas are suitable for recreation uses such as hiking and camping.

6. Hollis-Rock outcrop

Dominantly sloping and moderately steep, somewhat excessively drained and well drained, medium textured soils that are shallow over schist, granite, and gneiss; and Rock outcrop; on mountainous uplands

This unit consists of Rock outcrop and shallow soils that formed in glacial till deposits. The landscape is one of side slopes, valley sides, and hilltops of the mountainous uplands where the relief has been influenced by the underlying bedrock. The underlying crystalline bedrock and Rock outcrop is dominantly schist, gneiss, and granite. The slope is mainly 8 to 25 percent but ranges from 8 to 60 percent.

This unit makes up about 15 percent of the county. It is about 40 percent Hollis soils, 35 percent Rock outcrop, and 25 percent soils of minor extent.

The sloping to very steep Hollis soils are in mountainous uplands. They formed in a 10- to 20-inch mantle of glacial till deposits over schist, gneiss, and granite bedrock. They are shallow and are well drained to somewhat excessively drained. The rate of water movement is moderate or moderately rapid. The water table is generally not perched above the bedrock.

Areas of Rock outcrop protrude as ledges on side slopes and as angular and pointed blocks on ridge crests and hilltops. Some areas have a "stairstep" appearance because of the ledgy nature of the rock. Rock outcrop is dominantly crystalline schist, gneiss, and granite. Vegetation, if any, is sparse. The only plants are mosses and small bushes that have rooted in fractures and joints in the rock.

Of minor extent in this unit are large areas where the soil mantle is less than 10 inches thick and areas of a soil that is similar to Hollis soils but is 20 to 40 inches thick over bedrock. Also of minor extent are Charlton, Paxton, Alden, Palms, Mardin, Swartswood, and Wayland soils. The well drained Charlton soils are in many areas where the soil mantle is deeper than 5 feet. The well drained Paxton soils are in several areas where the soil mantle is deep. They have a fragipan. The Charlton and Paxton soils are closely associated in the landscape and are extremely stony at the surface. The very poorly drained Alden soils are in low, nearly level areas and depressions where there are a large number of stones and boulders on the surface. Very poorly drained Palms muck is also in depressions but in areas that have moderately deep organic deposits. The moderately well drained Mardin soils and well drained to moderately well

Figure 1.—Typical forested area of the Arnot-Swartswood-Hollis unit. Cleared fields are on the Riverhead-Middlebury-Chenango unit.

drained Swartswood soils are fragipan soils that occur in a few areas where the soil mantle is deep. Mardin soils have a higher silt content and a lower sand content than Swartswood soils. The poorly drained and very poorly drained Wayland soils are on low floodplains along a few streams that cross this unit.

This unit is mostly forested. It provides habitat for wildlife. Some areas can be improved for wildlife habitat or recreation. The soils in this unit are mostly unsuited to farming or community development because of the shallowness over bedrock, the outcrops of rock, the surface boulders, and, in many areas, the steep slopes. Some cleared areas that are now idle are reverting to brush and trees. Timber production is generally poor.

7. Hoosic-Mardin-Canandaigua

Dominantly gently sloping, deep, somewhat excessively drained to very poorly drained, moderately coarse tex-

tured and medium textured soils; on lowland plains and in valleys

These soils formed in glacial outwash, glacial till, and glacial lake deposits. The landscape is a series of low rounded hills and ridges interspersed with undulating terraces and low broad flats. These areas are along lower valley sides and valley bottoms and on rolling plains. The slope is dominantly 3 to 8 percent but ranges from 0 to 35 percent.

This unit makes up about 8 percent of the county. It is about 25 percent Hoosic soils, 20 percent Mardin soils, 20 percent Canandaigua soils, and 35 percent soils of minor extent.

Hoosic soils formed in glacial outwash deposits that have a high content of sand and gravel. They are nearly level to steep and occur on terraces, plains, and low complex sloping hills and ridges. They are deep, somewhat excessively drained, and moderately coarse textured. The substratum is coarse textured. The rate of water movement is moderately rapid or rapid through the subsoil and very rapid through the substratum. These soils tend to be droughty in summer.

Mardin soils formed in glacial till deposits derived mostly from shale, sandstone, and slate. These gently sloping to steep soils occur on hills and ridges interspersed among glacial outwash terraces and glacial lake plains. They are deep, moderately well drained, and medium textured. They have a fragipan. The rate of water movement is moderate through the surface layer and upper part of the subsoil and is slow or very slow through the fragipan and substratum. The dense pan, which begins 14 to 25 inches below the surface, restricts roots. Free water is perched above the pan for brief periods in spring.

Canandaigua soils formed in stone-free glacial lake deposits that are dominantly silt and clay. These nearly level soils occur in depressions and on low broad flats. They are deep, poorly drained and very poorly drained, and medium textured in the surface layer. The subsoil is medium textured or moderately fine textured, and the substratum is coarse textured. The rate of water movement is moderate or moderately slow through the surface layer and subsoil and moderately rapid through the substratum. A high water table is at or just below the surface in the wettest periods of the year. Some areas are ponded early in spring.

Of minor extent in this unit are Chenango, Oakville, Otisville, Fredon, Halsey, Scio, Raynham, Rhinebeck, Madalin, Palms, Bath, Pittsfield, Middlebury, and Wayland soils. The well drained to somewhat excessively drained Chenango soils on a few terraces and ridges are similar to Hoosic soils but have a higher silt content. The well drained Oakville soils are in a few dominantly stone-free sandy deposits. The excessively drained Otisville soils on a few terraces and knolls are similar to Hoosic soils but are coarser textured in the upper part of the subsoil. The somewhat poorly drained and poorly drained Fredon soils and very poorly drained Halsey soils are on low terraces and in depressions near Hoosic soils. The silty, moderately well drained Scio soils and somewhat poorly drained to poorly drained Raynham soils are on a few benches and slightly higher rises surrounding Canandaigua soils. The somewhat poorly drained Rhinebeck soils and poorly drained to very poorly drained Madalin soils are along some drainageways and in a few low areas where the clay content of the subsoil is higher than in the similar Raynham and Canandaigua soils. Very poorly drained Palms muck is in a few very low depressional areas where moderately deep organic deposits overlie mineral soil. Well drained Bath soils occupy a few convex glacial till ridges that receive little or no runoff from adjacent soils. Well drained Pittsfield soils are on glacial till hills and ridges interspersed among glacial outwash terraces and glacial lake plains. They do not have a pan. Moderately well drained to somewhat poorly drained Middlebury soils and poorly drained to very poorly drained Wayland soils are on alluvial flood plains along streams that cross this unit.

Many areas of this unit are farmed. Some are forested, and a few are idle or are used for community development. Canandaigua soils can be highly productive but tile or open ditch drains are required for most crops. The droughty Hoosic soils are generally best suited to early season or short season crops. They are well suited to community development, but pollution of the underground water table by effluent from septic tank absorption fields is a hazard. They are also good sources of sand and gravel. In the Mardin soils seasonal wetness and the dense fragipan are the major problems for most uses.

8. Riverhead-Middlebury-Chenango

Dominantly nearly level and gently sloping, deep, somewhat excessively drained to somewhat poorly drained, moderately coarse textured and medium textured soils; on valley floors and plains

These soils formed in glacial outwash and recent alluvial deposits. The landscape is a series of terraces, benches, rolling knolls, and ridges and flood plains along valley floors and on outwash plains. The slope is mainly 0 to 8 percent but ranges from 0 to 25 percent.

This unit makes up about 2 percent of the county. It is about 25 percent Riverhead soils, 20 percent Middlebury soils, 20 percent Chenango soils, and 35 percent soils of minor extent.

Riverhead and Chenango soils formed in similar glacial outwash deposits that have a high content of sand and gravel.

The nearly level to moderately steep Riverhead soils are on terraces, plains, and low complex sloping hills and ridges. They are deep and well drained. The surface layer is moderately coarse textured, and the subsoil is dominantly moderately coarse textured. The substratum is coarse textured stratified sand and gravel. The rate of

water movement is moderately rapid through the surface layer and subsoil and is very rapid through the substratum. Depth to the water table is usually more than 6 feet.

The nearly level Middlebury soils formed in silty alluvial deposits on flood plains along streams. They are deep, moderately well drained to somewhat poorly drained, and medium textured. The substratum is commonly coarse textured sand and gravel. Water movement is moderate through the surface layer and subsoil and rapid or very rapid in the substratum. There is a high water table in the subsoil in spring. The level of the water table is commonly controlled by the water level in the adjacent stream. In spring these soils are subject to occasional flooding.

The nearly level to sloping Chenango soils are on terraces, plains, and rounded complex sloping knolls and ridges. They are deep, well drained and somewhat excessively drained, and medium textured. The subsoil has a high content of gravel. The substratum is coarse textured stratified sand and gravel. The rate of water movement is moderate or moderately rapid through the surface layer and subsoil and rapid through the substratum. Depth to the water table is usually more than 6 feet.

Of minor extent in this unit are Hoosic, Oakville, Unadilla, Collamer, Castile, Fredon, Halsey, Barbour, Basher, Suncook, Tioga, Wayland, and Allard soils. The somewhat excessively drained Hoosic soils on terraces are similar to Chenango soils but have a higher sand content in the subsoil. The well drained Oakville soils are on a few terraces and remnant deltas that have a high sand content but a low gravel content. The well drained Unadilla soils and moderately well drained Collamer soils are on old alluvial terraces that are dominantly deep silty deposits. Moderately well drained Castile soils, somewhat poorly drained to poorly drained Fredon soils, and very poorly drained Halsey soils are on low terraces, along drainageways, and in depressions containing gravelly glacial outwash deposits. Well drained Barbour soils and moderately well drained to somewhat poorly drained Basher soils formed in alluvial deposits on flood plains where the sand content is higher than in the similar Middlebury soils. The excessively drained Suncook soils are in a few areas where the alluvial deposits are coarse textured sandy sediments. The well drained silty Tioga soils occur on flood plains adjacent to Middlebury soils but on slightly higher berms. The poorly drained and very poorly drained Wayland soils are in low slack-water areas in flood plains. The well drained Allard soils are on a few terraces that have a silt mantle overlying gravelly outwash deposits.

This unit is mostly farmed (fig. 1). The major soils are well suited to most crops, including corn, small grain, hay, orchard crops, and early market crops. Droughtiness is a hazard in midsummer on Riverhead and Chenango soils, and seasonal wetness is a minor limitation in Middlebury soils. In some areas the potential for irrigation is excellent. Many areas are good sites for community development. Middlebury soils and other alluvial soils in the unit should be avoided as building sites because of the flood hazard.

9. Carlisle-Wayland

Dominantly level, deep, very poorly drained organic soils and nearly level, deep, poorly drained and very poorly drained, medium textured mineral soils; on depressional lowlands and flood plains

These soils formed in well decomposed organic deposits and in silty alluvial deposits on flood plains. The landscape is one of broad, nearly level depressional areas crossed by meandering streams. The slope is mostly less than 1 percent and is no more than 3 percent.

This unit makes up about 3 percent of the county. It is about 55 percent Carlisle soils, 20 percent Wayland soils, and 25 percent soils of minor extent.

Carlisle soils formed in well decomposed organic deposits derived from herbaceous and woody plant remnants. These level muck soils are in broad depressions in lowlands. They are deep and are very poorly drained in the natural state. Water movement through the organic material ranges from moderately slow to moderately rapid depending on the degree of compaction. In undrained areas, the water table is usually at or near the surface.

Wayland soils formed in silty alluvial deposits on flood plains. These nearly level soils occupy low areas, old oxbows, and slack-water areas. They are deep, poorly drained and very poorly drained, and medium textured. The subsoil is medium textured or moderately fine textured. The rate of water movement is moderate or moderately slow through the surface layer and slow through the subsoil and substratum. The water table, which is at or near the soil surface for prolonged periods, is usually controlled by the water level in adjacent streams. The soils are subject to frequent flooding.

Of minor extent in this unit are Wallkill, Tioga, Middlebury, Basher, Palms, Canandaigua, Madalin, Pittsfield, and Riverhead soils; areas of Udifluvents-Fluvaquents complex, frequently flooded; and areas of Histic Humaquepts, ponded. The very poorly drained Wallkill soils occur along some streams where silty alluvial deposits overlie organic (muck) deposits. The well drained Tioga soils and moderately well drained to somewhat poorly drained Middlebury soils are on higher parts of the flood plain near the lower Wayland soils. The moderately well drained to somewhat poorly drained Basher soils are also on flood plains in a few areas where the sand content is higher than in the similar Wayland soils. Very poorly drained Palms muck is at the fringe of areas of Carlisle muck where the underlying mineral soil deposits are closer to the surface. The poorly drained and very poorly drained silty Canandaigua soils and clayey Madalin soils are in a few areas of lake-laid deposits. The well drained Pittsfield soils occupy a few glacial till ridges that rise above the adjacent lowland. The well drained River-

head soils are on a few terraces of glacial outwash deposits. Udifluvents and Fluvaquents adjacent to a few streams are subject to frequent flooding. Histic Humaquepts, more commonly called freshwater marsh, are in areas where shallow water covers the surface throughout most of the year.

A large area of this unit has been drained and is used intensively for specialized crops such as onions, celery, and lettuce and sod for lawns (fig. 2). Drainage is needed for crop production on the major soils in this unit. Where drainage is feasible, additional acres could be cultivated. If adequately drained, these soils are exceptionally productive of specialized crops. Some undrained areas support marsh grasses and water-tolerant brush, which provide habitat for wetland wildlife. In many areas wildlife habitat can be improved by excavating shallow ponds or blasting potholes. This unit is not suitable for most community development because of flooding, ponding, prolonged wetness, and the unstable nature of the soil.

Figure 2.—Drained areas of the Carlisle-Wayland unit are well suited to vegetable crops, such as celery.

Soil maps for detailed planning

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

This survey has both narrowly defined and broadly defined units. Broadly defined units are more variable in composition than other units but can be interpreted for the expected uses of the soils. They are indicated by symbols in which all letters are capitals. They are also indicated by a footnote on the soil legend at the back of this publication.

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Mardin gravelly silt loam, 3 to 8 percent slopes, is one of several phases in the Mardin series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Arnot-Lordstown complex, sloping, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Otisville and Hoosic soils, steep, is an undifferentiated group in this survey area.

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

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

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

Soil descriptions

Ab—Alden silt loam. This deep, very poorly drained, nearly level soil formed in glacial till deposits derived from shale, sandstone, and some limestone. Local silty colluvial sediment commonly mantles the glacial till deposits. This soil is in low areas and depressions in uplands. The slope ranges from 0 to 3 percent but is mostly less than 2 percent. Areas are mostly round and 5 to 10 acres.

Typically the surface layer is very dark grayish brown silt loam 9 inches thick. The subsoil is 27 inches thick. The upper 10 inches is mottled dark gray heavy silt loam; the middle 9 inches is mottled greenish gray silt loam; and the lower 8 inches is mottled dark grayish brown loam. The substratum is firm, mottled olive brown fine sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of somewhat poorly drained Erie soils on slightly higher rises and in fringe areas, a few spots where the surface layer is mucky, and areas where a large number of stones are on the surface.

In this Alden soil the water table is at or near the surface for prolonged periods. Many areas are ponded for brief periods in spring. Permeability is moderately slow in the subsoil and substratum. Available water capacity is high, and runoff is very slow. Unless this soil is drained, roots are mostly confined to the upper 8 to 14 inches. Natural organic matter content is high. The surface layer and subsoil are 0 to 15 percent gravel fragments. Reaction in the surface layer is slightly acid or neutral.

Most areas are idle and support only the grasses, shrubs, and trees that tolerate wetness (fig. 3).

Figure 3.—Marshy type bunch grass is typical on Alden silt loam.

This soil is not suited to most crops unless drained. Drainage outlets are often difficult to establish because of the low position on the landscape. Where drainage is feasible, many crops can be grown. Minimum tillage, cover crops, tillage at the proper moisture content, and return of crop residue help to maintain high organic levels and promote tilth. Some areas provide good sites for ponds—a source of irrigation water for use on adjacent better drained soils.

Partly drained areas can be used for pasture. Grazing in wet periods compacts the soil and destroys desirable grasses.

Suitability for timber production is limited because of wetness. Such species as red maple, white spruce, eastern hemlock, and white cedar are suitable. Equipment limitation, seedling mortality, and windthrow are serious problems. Machine planting of seedlings is generally not feasible because of wetness.

This soil is poorly suited to most urban uses because of prolonged wetness and moderately slow permeability. In urban areas it is often left in natural open-space borders. Some areas are well suited to the development of wildlife marshes or ponds for recreation.

The capability subclass is IVw.

AC—Alden extremely stony soils. These deep, very poorly drained, nearly level soils are in depressions and low areas. They formed in glacial till that is commonly mantled with local silty colluvial material. Stones and boulders more than 10 inches in diameter are less than 5 feet apart on the surface. The surface layer is silt loam or loam. The slope ranges from 0 to 3 percent. Areas are generally round and 5 to 15 acres.

Typically the surface layer is very dark grayish brown silt loam 9 inches thick. The subsoil is 27 inches thick. The upper 10 inches is dark gray heavy silt loam; the middle 9 inches is mottled greenish gray silt loam; and the lower 8 inches is mottled dark grayish brown loam. The substratum is firm, mottled olive brown fine sandy loam to a depth of 60 inches or more.

Included in mapping are several small areas of soils that have no stones on the surface or have fewer stones on the surface than Alden soils. Also included are a few areas of the somewhat poorly drained Erie soils on slight rises and several areas where the surface layer is mucky.

The water table is at or near the surface for prolonged periods. Many areas are ponded for brief periods in spring. Permeability is moderately slow in the subsoil and substratum. Runoff is very slow, and available water capacity is high. In undrained areas, roots are confined to a depth of 8 to 14 inches. Organic matter content is high. The upper part of these soils is 0 to 15 percent gravel fragments. The surface layer is slightly acid or neutral.

Wetness and the large stones on the surface make these soils unsuitable for most crops. The low position on the landscape makes drainage outlets difficult to establish. If drainage and the removal of stones are feasible, the soils are suitable for some crops. If the soils are used for crops, minimum tillage, cover crops, tillage at the proper moisture content, and the return of crop residue are needed to maintain the organic matter content and tilth.

If partial drainage is feasible, these soils can be used for pasture. Grazing when the soils are wet compacts the soil and destroys desirable grasses.

Wetness limits suitability for timber production. Red maple, white spruce, eastern hemlock, and white cedar are suited. Windthrow and high seedling mortality are serious hazards. Wetness and the stones on the surface limit the use of equipment.

These soils are poorly suited to most urban uses because of prolonged wetness, moderately slow permeability, and large stones on the surface. Some areas are suitable for the development of wildlife marshes or ponds for recreation.

The capability subclass is VIIs.

AdA—Allard silt loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil formed in silty de-

posits over sandy or gravelly glacial outwash. It is on terraces and benches along valley floors. Areas are oblong and are commonly 5 to 10 acres.

Typically the surface layer is dark brown silt loam 9 inches thick. The subsoil is 27 inches thick. The upper part is dark yellowish brown silt loam, and the lower part is yellowish brown silt loam. The substratum to a depth of 60 inches or more is loose, dark brown stratified coarse sand.

Included with this soil in mapping are small areas of the well drained Unadilla soils and moderately well drained Scio soils. Both have a thicker layer of silt than Allard soil. Also included are small pockets of silty, somewhat poorly drained to poorly drained Raynham soils in low areas and slight depressions and somewhat excessively drained Hoosic soils and well drained to somewhat excessively drained Chenango soils on a few small gravelly terraces that do not have the silty mantle.

Depth to the water table is 6 feet or more throughout the year. Permeability is moderate in the surface layer and subsoil and is rapid to very rapid in the substratum. Available water capacity is high, and runoff is slow. Root growth is generally not restricted. Natural organic matter content is low. The surface layer is 0 to 3 percent gravel fragments. In unlimed areas, it is very strongly acid to medium acid.

Most areas are farmed. The soil is well suited to cultivated crops, small grain, hay, vegetable crops, and nursery stock. Maintaining tilth and improving fertility are the principal management needs. Erosion is a concern in areas left bare of a plant cover for long periods. Minimum tillage, cover crops, return of crop residue, and sod crops preserve tilth, improve the organic matter content, and reduce the hazard of erosion. This nearly gravel-free soil is well suited to irrigation, particularly for vegetable crops. It is easier to irrigate than the more sloping Allard soils.

Pasture grasses are well suited to this soil. Proper stocking, restricted grazing in wet periods, and rotation grazing are needed to maintain the pasture seeding.

Suitability for timber production is fair to good. The few forested areas support such species as sugar maple, northern red oak, and white ash. There are few limitations on the use of equipment and little hazard of erosion or windthrow. Seedling mortality is low because of the high available water capacity.

This soil is well suited to most urban and recreation uses. Many areas provide good homesites, but pollution of the water table by onsite septic systems is a hazard. Some areas have excellent potential for athletic fields and other uses that require a nearly level site.

The capability class is I.

AdB—Allard silt loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil formed in silty deposits over sandy or gravelly glacial outwash deposits. It is on undulating terraces and convex benches along valley floors and on plains. Many areas are oblong and commonly 5 to 10 acres. Some are narrow and long.

Typically the surface layer is dark brown silt loam 9 inches thick. The subsoil is 26 inches thick. The upper part is dark yellowish brown silt loam, and the lower part is yellowish brown silt loam. The substratum to a depth of 60 inches or more is loose, dark brown stratified coarse sand.

Included with this soil in mapping are small areas of well drained Unadilla soils and moderately well drained Scio soils where the silty mantle is deeper than in Allard soil, some areas where the silty mantle is less than 20 inches thick, and a few areas of the somewhat excessively drained gravelly Hoosic soils and well drained sandy Oakville soils, which do not have a silty mantle. Pockets of the silty, somewhat poorly drained to poorly drained Raynham soils in a few low areas and slight depressions are indicated by spot symbols on the soil map.

Depth to the water table is 6 feet or more throughout the year. Permeability is moderate in the surface layer and subsoil and is rapid to very rapid in the substratum. Available water capacity is high, and runoff is slow to medium. Roots are generally not restricted. Natural organic matter content is low. The surface layer and subsoil are 0 to 3 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas are farmed. Only a few areas are idle or forested.

This soil is well suited to cultivated crops, small grain, hay, vegetable crops, and nursery stock. The principal management concerns are controlling erosion, maintaining tilth, and improving fertility. Erosion is a serious hazard on this silty soil, particularly on long slopes or in areas left bare of a plant cover. Minimum tillage, cover crops, return of crop residue, cross-slope tillage, and sod crops in the cropping system preserve tilth, improve organic matter content, and reduce the serious erosion hazard. This nearly gravel-free soil has fair potential for irrigation, particularly for vegetable crops. Generally irrigation systems are more difficult to manage on this soil than on the nearly level Allard soil.

Pasture grasses do well on this soil. Proper stocking, restricted grazing in wet periods, and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is fair to good. Woodlots support such species as sugar maple, northern red oak, and white ash. There are few equipment limitations and no windthrow hazard. Erosion along logging trails is a risk in some areas. Seedling mortality is low because of the high available water capacity.

This soil is suited to most urban and recreation uses. Many areas provide good sites for dwellings, but pollution of the water table by onsite septic effluent is a hazard. Because the soil is highly erodible, nearby streams should be protected from siltation and pollution during construction.

The capability subclass is IIe.

ANC—Arnot-Lordstown complex, sloping. These shallow and moderately deep soils formed in glacial till deposits derived from sandstone and shale. The shallow Arnot soil is somewhat excessively drained to moderately well drained. The moderately deep Lordstown soil is well drained. These gently sloping to sloping soils occupy hillsides and hilltops on uplands. In many areas the surface has a "stairstep" appearance because of the underlying ledgy horizontal bedrock. The slope is mainly 8 to 15 percent but ranges from 3 to 15 percent. The surface layer is channery silt loam or channery loam. Areas are mostly oval and 15 to 100 acres.

This complex is about 50 percent Arnot soil, 35 percent Lordstown soil, and 15 percent other soils. Areas of Arnot and Lordstown soils occur in such an intricate pattern that they were not mapped separately.

Typically the Arnot soil has a surface layer of dark brown channery silt loam 4 inches thick. The subsoil is reddish brown very channery silt loam 11 inches thick. Brown and gray sandstone is at a depth of 15 inches.

Typically the Lordstown soil has a thin, well decomposed leaf mat over a 6-inch surface layer of very dark grayish brown channery silt loam. The subsoil is 31 inches thick. The upper part is yellowish brown channery loam, and the lower part is light olive brown channery loam. Brown sandstone is at a depth of 37 inches.

Included with this complex in mapping are small areas where the mantle of soil is deeper than 5 feet and a fragipan has formed. These are areas of the well drained to moderately well drained Swartswood soils and moderately well drained to somewhat poorly drained Wurtsboro soils. The moderately well drained Mardin soils occur in a few areas where the mantle is deep. Also included are a few areas where the mantle has been eroded and bedrock is exposed. The deep, somewhat poorly drained Erie soils and the deep, very poorly drained Alden soils occur in a few low areas and depressions that are identified by spot symbols on the soil map. Some included areas are nearly level.

Where the bedrock under the Arnot soil is poorly fractured and jointed, the water table is perched above the rock for brief periods in spring. Seldom is the water table seasonally high in Lordstown soils. Permeability is moderate in both soils. Runoff is medium to rapid. Available water capacity is low or very low in the Arnot soil, and moderate to low in the Lordstown soil. Depth to rock is 10 to 20 inches in the Arnot soil and 20 to 40 inches in the Lordstown soil. Bedrock restricts roots. Natural organic matter content is low. The surface layer of both soils is 15 to 35 percent channery or gravel fragments. In unlimed areas, it is extremely acid to medium acid in the Arnot soil and very strongly acid to slightly acid in the Lordstown soil.

Most areas are either forested or idle. Some are pastured.

This unit is poorly suited to cultivated crops but can be used for hay and pasture. The principal limitations for cultivated crops are slope, erosion hazard, midsummer droughtiness, high content of channery fragments, shallowness over rock, and the irregular "stairstep" slopes. In areas where it is feasible to grow cultivated crops, cross-slope tillage, minimum tillage, cover crops, and a cropping system with a high proportion of sod crops are needed. These practices reduce the erosion hazard, conserve moisture, increase organic matter content, and improve tilth.

Many areas are suitable for pasture, but droughtiness is a limitation in midsummer. Rotation grazing and adequate fertilizer and lime are needed to maintain desirable pasture plant species.

Suitability for timber production is fair to poor. Woodlots commonly support such species as sugar maple, white ash, and northern red oak. There are few limitations for equipment, and there is generally no erosion hazard except along skid trails that have excessive grade. Seedling mortality is a hazard because of droughtiness. Windthrow is a hazard because of the restricted root zone.

This complex is poorly suited to most urban uses because of the depth to rock. Some areas are suitable for dwellings without basements. Site selection is important. Grading is to be avoided. Many areas are suitable for recreation uses, such as camp areas and paths and trails.

The capability subclass is IVe.

AND—Arnot-Lordstown complex, moderately steep. These shallow and moderately deep soils formed in glacial till deposits derived from sandstone and shale. The shallow Arnot soil is somewhat excessively drained to moderately well drained, and the moderately deep Lordstown soil is well drained. These moderately steep to steep soils occupy hillsides and valley sides on uplands. In many areas the surface has a "stairstep" appearance because of the underlying ledgy horizontal bedrock. The slope is mainly 15 to 25 percent but ranges from 15 to 35 percent. The surface layer is channery silt loam or channery loam. Areas are mostly oblong and about 15 to 30 acres.

This complex is about 60 percent Arnot soil, 30 percent Lordstown soil, and 10 percent other soils. Areas of Arnot and Lordstown soils occur in such an intricate pattern that they were not mapped separately.

Typically the Arnot soil has a surface layer of dark brown channery silt loam 3 inches thick. The subsoil is reddish brown very channery silt loam 11 inches thick. Brown and gray sandstone is at a depth of 14 inches.

Typically the Lordstown soil has a thin, well decomposed leaf mat over a 5-inch surface layer of very dark grayish brown channery silt loam. The subsoil is 30 inches thick. The upper part is yellowish brown channery loam, and the lower part is light olive brown channery loam. Brown sandstone is at a depth of 35 inches.

Included with this soil complex in mapping are small areas of deep, well drained to moderately well drained Swartswood soils, deep, moderately well drained to

somewhat poorly drained Wurtsboro soils, and deep, moderately well drained Mardin soils. Swartswood and Wurtsboro soils have a fragipan. Also included are many spots of exposed bedrock, some areas that are severely eroded, and areas of the deep, somewhat poorly drained Erie soils and deep, very poorly drained Alden soils in a few low areas and depressions in foot slopes.

Where the bedrock under the Arnot soil is poorly fractured and jointed, the water table is perched above the rock for brief periods in spring. Seldom is the water table seasonally high in Lordstown soils. Permeability is moderate in both soils. Runoff is rapid. Available water capacity is low or very low in the Arnot soil, and moderate to low in the Lordstown soil. Depth to bedrock is 10 to 20 inches in the Arnot soil and 20 to 40 inches in the Lordstown soil. Bedrock restricts roots. Natural organic matter content is low. The surface layer of both soils is 15 to 35 percent channery or gravelly fragments. In unlimed areas, the surface layer is extremely acid to medium acid in the Arnot soil and very strongly acid to slightly acid in the Lordstown soil.

Most areas are either forested or idle. A few areas are pastured.

This complex is not suited to cultivated crops but has limited potential for hay and pasture. Reseeding and harvesting of hay are somewhat difficult because of the steepness of slope. Areas of Rock outcrop make the use of modern equipment difficult. Liberal application of lime and fertilizer is needed for optimum yield. Droughtiness in midsummer frequently reduces yields and lowers quality of the forage.

This complex is suited to pasture grasses, but droughtiness in midsummer limits growth. Overgrazing can result in sparse vegetation, which increases the hazard of erosion. Proper stocking, rotation grazing, and lime and fertilizer are needed to maintain seedings.

Suitability for timber production is fair to poor. Woodlots commonly support such species as sugar maple, white ash, and red oak. The use of equipment is somewhat difficult because of the slope. Erosion is a serious hazard, unless logging trails are laid out across the slope. It is also a serious hazard in areas that are clearcut. Seedling mortality and windthrow are serious hazards, particularly in areas that are dominantly Arnot soil.

This soil complex is not suited to most urban uses because of depth to bedrock and steepness of slope. Areas near urban centers often provide open-space corridors. Most recreation uses are limited because of slope. Some areas have good potential for the improvement of wildlife habitat.

The capability subclass is VIe.

ANF—Arnot-Lordstown complex, very steep. These shallow and moderately deep soils formed in glacial till deposits derived from sandstone and shale. The shallow Arnot soil is somewhat excessively drained to moderately well drained, and the moderately deep Lordstown soil is well drained. These very steep soils occupy hillsides, valley sides, side slopes of dissecting gullies, and mountainsides of the uplands. In many areas the surface has a "stairstep" appearance because of the underlying ledgy horizontal bedrock. The slope ranges from 35 to 50 percent. Areas are mostly long and narrow and about 5 to 50 acres.

This complex is about 65 percent Arnot soil, 25 percent Lordstown soil, and 10 percent other soils. Areas of Arnot and Lordstown soils occur in such an intricate pattern that they were not mapped separately.

Typically the Arnot soil has a dark brown channery silt loam surface layer 3 inches thick. The subsoil is reddish brown very channery silt loam 10 inches thick. Brown and gray sandstone is at a depth of 13 inches.

Typically the Lordstown soil has a thin, well decomposed leaf mat over a 5-inch surface layer of very dark grayish brown channery silt loam. The subsoil is 29 inches thick. The upper part is yellowish brown channery loam, and the lower part is light olive brown channery loam. Brown sandstone is at a depth of 34 inches.

Included with this soil complex in mapping are small areas of deep, well drained to moderately well drained Swartswood soils, deep, moderately well drained to somewhat poorly drained Wurtsboro soils, and deep, moderately well drained Mardin soils. Swartswood soils and Wurtsboro soils have a fragipan. Also included are some areas where the soil mantle has been eroded and bedrock is exposed and a few areas of deep, somewhat poorly drained Erie soils in low areas on foot slopes.

Where the bedrock under the Arnot soil is poorly fractured and jointed, the water table is perched above the rock for brief periods in spring. Seldom is the water table seasonally high in the Lordstown soil. Permeability is moderate in both soils. Runoff is very rapid. Available water capacity is low or very low in the Arnot soil and moderate to low in the Lordstown soil. Depth to bedrock is 10 to 20 inches in the Arnot soil and 20 to 40 inches in the Lordstown soil. Bedrock restricts roots. Natural organic matter content is low. The surface layer of both soils is 15 to 35 percent channery or gravelly fragments. In unlimed areas, the surface layer is extremely acid to medium acid in the Arnot soil and very strongly acid to slightly acid in the Lordstown soil.

Most areas are forested.

This soil complex is not suitable for crop production because of slope. It has very limited suitability for pasture. Generally pasture is poor in quality because of the difficulty in reseeding and fertilizing. Erosion is a very serious hazard in overgrazed areas. Rotation grazing reduces this hazard.

Suitability for timber production is fair to poor. Woodlots commonly are such trees as sugar maple, white ash, and northern red oak. Equipment limitation and the hazard of erosion are serious problems because of steepness of slope. Gullying along skid trails is a particularly serious hazard. Machine planting of seedlings is generally not practical. Seedling mortality is high because of droughtiness. Windthrow is a hazard because of the restricted root depth.

This complex is not suited to urban uses because of the very steep slopes. Recreation uses are also limited. Some slopes are suitable for skiing.

The capability subclass is VIIe.

Ba—Barbour fine sandy loam. This deep, well drained, nearly level soil formed in recent reddish alluvial deposits. It is on flood plains along streams and rivers. The slope ranges from 0 to 3 percent. Areas are mostly long and narrow, but along major streams they are wider. Commonly areas are 10 to 20 acres.

Typically the surface layer is dark reddish brown fine sandy loam 11 inches thick. The subsoil is 17 inches thick. The upper part is reddish brown very fine sandy loam, and the lower part is reddish brown fine sandy loam. The substratum to a depth of 60 inches or more is loose, brown fine sand.

Included with this soil in mapping are spots of moderately well drained to somewhat poorly drained Basher soils in slightly lower areas. Also included are a few very low areas of poorly drained and very poorly drained Wayland soils and small areas where the surface layer is gravelly, all of which are indicated by spot symbols on the soil map.

Occasional flooding is a hazard in spring. The seasonal high water table, which is partly controlled by the water level in the adjacent stream, rises into the upper part of the substratum for brief periods early in spring. Permeability is moderate in the surface layer, moderately rapid in the subsoil, and rapid in the substratum. Runoff is medium to slow, and available water capacity is moderate. Roots can easily penetrate the substratum. Natural organic matter content is medium. There are generally no gravel fragments in the surface layer, but the content of gravel fragments can range up to 15 percent. In unlimed areas, the surface layer ranges from very strongly acid to medium acid.

Most areas are farmed. Some are idle.

This soil is well suited to cultivated crops, small grain, hay, and vegetable crops. Controlling flood scour and maintaining soil tilth are important management concerns. Return of crop residue, cover crops, and sod crops in the cropping system reduce the hazard of scour and erosion from flooding and improve soil tilth. This nearly gravel-free soil is easy to cultivate, but it should be tilled at the proper moisture content to prevent soil compaction and loss of tilth. Early crops can be damaged by spring flooding.

This soil is suitable for pasture. Overgrazing and grazing in wet periods are principal concerns. Rotation grazing, proper stocking, and restricted grazing in wet periods are needed to maintain pasture seedings.

Suitability for timber production is good. Woodlots commonly support such trees as sugar maple and northern red oak. Equipment limitation, seedling mortality, and the hazard of erosion or windthrow are generally not problems.

This soil is poorly suited to urban uses because of occasional flooding. It is suited to such recreation uses as picnic areas, golf courses, and paths and trails. Recreation facilities should be anchored in place because of the flood hazard. Some areas provide topsoil.

The capability class is I.

Be—Basher fine sandy loam. This deep, moderately well drained to somewhat poorly drained, nearly level soil formed in recent reddish alluvial deposits. It is on flood plains along streams and rivers. The slope is 0 to 3 percent. Areas are mostly long and narrow, but along major streams they become wider. Commonly areas are 10 to 40 acres.

Typically the surface layer is dark brown fine sandy loam 13 inches thick. The subsoil is 17 inches thick. The upper part is reddish brown fine sandy loam, and the lower part is mottled reddish brown fine sandy loam. The substratum to a depth of 60 inches or more is mottled reddish brown very fine sandy loam.

Included with this soil in mapping are higher spots of well drained Barbour soils and a few very low areas of poorly drained and very poorly drained Wayland soils. Small areas where the surface layer is gravelly are identified by spot symbols on the soil map.

During spring this soil is occasionally flooded. A seasonal water table, partly controlled by the water level in the adjacent stream, rises into the subsoil. Permeability is moderate in the surface layer and subsoil and moderate or moderately rapid in the substratum. Runoff is slow, and available water capacity is high. Roots can easily penetrate to the substratum. Natural organic matter content is medium to high. In most areas the soil is gravel-free, but in some areas the surface layer and upper part of the subsoil are as much as 10 percent gravel fragments. The surface layer ranges from extremely acid to medium acid in unlimed areas.

Most areas of this soil are either farmed or idle.

This nearly level, gravel-free soil is easy to till. This soil is suited to cultivated crops, small grain, and hay. Control of flood scour and maintenance of tilth are important management concerns. Wetness in spring delays planting for many crops. The soil is somewhat difficult to drain because of the water level in the adjacent stream and the lack of good outlets. Drainage outlets often have to be located considerable distances downstream. Return of crop residue, cover crops, and sod crops in the cropping system reduce the hazard of flood scour and erosion and help to maintain tilth. Cultivation at the proper moisture content is needed to prevent compaction. There is little or no hazard of flooding during the growing season.

This soil is suitable for pasture. Grazing in wet periods and overgrazing should be avoided. Restricted grazing in wet periods, rotation grazing, and proper stocking are needed to maintain pasture seedings.

Suitability for timber production is good. Woodlots commonly support such trees as sugar maple, northern red oak, and basswood. Equipment limitation, seedling mortality, and the hazard of erosion or windthrow are

generally not problems. Machine planting of seedlings early in spring can be somewhat difficult because of wetness and flooding.

This soil is poorly suited to most urban uses because of occasional flooding and seasonal wetness. Areas near urban centers often serve as natural open-space borders. Some areas are suitable for recreation uses such as picnic areas and paths and trails.

The capability subclass is IIw.

BnB—Bath-Nassau shaly silt loams, 3 to 8 percent slopes. This soil complex consists of deep, well drained soils and shallow, somewhat excessively drained soils that formed in glacial till deposits derived from shale and slate. These gently sloping soils are on hilltops and ridges in uplands. Because of the underlying folded and tilted bedrock the topography is often irregular and sloping in many directions. Areas are mostly long and oval and 5 to 30 acres.

This complex is about 50 percent Bath soil, 30 percent Nassau soil, and 20 percent other soils. Areas of Bath and Nassau soils occur in such an intricate pattern that they were not mapped separately.

Typically the Bath soil has a dark brown shaly silt loam surface layer 9 inches thick. The subsoil is 44 inches thick. The upper 17 inches is yellowish brown shaly silt loam; the middle 3 inches is mottled olive brown shaly silt loam; and the lower part is an olive brown very shaly silt loam fragipan. Dark gray shale bedrock is at a depth of 53 inches.

Typically the Nassau soil has a dark grayish brown shaly silt loam surface layer 10 inches thick. The subsoil is yellowish brown very shaly silt loam 9 inches thick. Hard dark gray shale bedrock is at a depth of 19 inches.

Included with this soil complex in mapping are small concave inter-ridge areas of somewhat poorly drained Erie soils. Moderately well drained Mardin soils are included in a few areas where depth to the fragipan is less than 26 inches. Also included are some large areas of a moderately deep soil similar to Nassau and a few severely eroded areas where bedrock is at or near the surface.

In the Bath soil a perched water table is above the fragipan for very brief periods early in spring. In the Nassau soil there is no seasonal high water table above the bedrock. Permeability in the Bath soil is moderate in the subsoil above the fragipan and is slow or very slow in the fragipan. In the Nassau soil permeability is moderate throughout. Runoff is slow to medium in both soils. Available water capacity is moderate in the Bath soil and low to very low in the Nassau soil. Depth to bedrock is 40 to 60 inches in the Bath soil, and 10 to 20 inches in the Nassau soil. Roots are restricted by the fragipan in the Bath soil and by bedrock in the Nassau soil. Natural organic matter content is low in both soils. The surface layer of both soils is 15 to 35 percent gravel fragments, dominantly shale. In unlimed areas, the surface layer is very strongly acid to medium acid in the Bath soil and very strongly acid or strongly acid in the Nassau soil.

Most areas are either farmed or idle. Some are forested.

The soils are suited to selected row crops, small grain, and hay. The droughtiness of the shallow Nassau soil, the high content of shale fragments, and the irregular topography are limitations for some cultivated crops. Erosion is a moderate hazard, particularly on long slopes. Minimum tillage, return of crop residue, cover crops, and cross-slope tillage where practical reduce the erosion hazard, maintain tilth, and improve the organic matter content. Increased organic matter content improves the available water capacity, thus reducing the hazard of midsummer droughtiness.

This soil complex is suited to pasture, but growth is often slow in midsummer in the Nassau soil because of droughtiness. Rotation grazing and lime and fertilizer are needed to maintain pasture seedings.

Suitability for timber production is good to fair in the Bath soil and poor in the Nassau soil. Woodlots commonly support such species as sugar maple and northern red oak. Equipment limitation and erosion hazard are generally not problems. Seedling mortality and windthrow are serious hazards on the Nassau soil because of droughtiness and the shallow root zone.

This soil complex varies in suitability for urban development. The Bath soil has a slowly or very slowly permeable fragipan at a depth of 26 to 40 inches and has bedrock at 40 to 60 inches. Bedrock at this depth is a limitation for deep excavations such as pipelines and basements for dwellings. Shallowness over bedrock in the Nassau soil is a severe limitation for most urban uses. Some areas provide suitable sites for dwellings without basements, but excessive grading should be avoided. Many areas are suitable for recreation uses such as campsites and picnic areas. Small stones on the surface are bothersome for some recreation uses.

The capability subclass is IIIe.

BnC—Bath-Nassau shaly silt loams, 8 to 15 percent slopes. This soil complex consists of deep, well drained soils and shallow, somewhat excessively drained soils that formed in glacial till deposits derived from shale and slate. These sloping soils are on hillsides and ridges in uplands. Because of the underlying folded and tilted bedrock the topography is often irregular and sloping in many directions. Areas are mostly oblong and 10 to 20 acres.

This complex is about 50 percent Bath soil, 30 percent Nassau soil, and 20 percent other soils. Areas of Bath and Nassau soils occur in such an intricate pattern that they were not mapped separately.

Typically the Bath soil has a dark brown shaly silt loam surface layer 9 inches thick. The subsoil is 42 inches thick. The upper 17 inches is yellowish brown shaly silt loam; the middle 3 inches is mottled, olive brown shaly silt loam; and the lower part is an olive brown very shaly silt loam fragipan. Dark gray shale bedrock is at a depth of 51 inches.

Typically the Nassau soil has a dark grayish brown shaly silt loam surface layer 9 inches thick. The subsoil is yellowish brown very shaly silt loam 8 inches thick. Hard, dark gray shale bedrock is at a depth of 17 inches.

Included with this soil complex in mapping are somewhat poorly drained Erie soils in small concave interridge areas and along drainageways. Moderately well drained Mardin soils are included in a few places where the depth to the fragipan is less than 26 inches. Also included are some areas of a moderately deep soil similar to the Nassau soil and some severely eroded areas where rock is exposed.

In the Bath soil a perched seasonal high water table moves laterally across the top of the fragipan for very brief periods early in spring. In the Nassau soil there is no seasonal high water table above the bedrock. Permeability in the Bath soil is moderate in the subsoil above the fragipan and slow or very slow in the pan. Permeability in the Nassau soil is moderate. Runoff is medium in both soils. Available water capacity is moderate in the Bath soil and low to very low in the Nassau soil. Depth to bedrock is 40 to 60 inches in the Bath soil and 10 to 20 inches in the Nassau soil. Roots are restricted by the fragipan in the Bath soil and by bedrock in the Nassau soil. Natural organic matter content is low in both soils. The surface layer of both soils is 15 to 35 percent gravel fragments, commonly shale. In unlimed areas, the surface layer is very strongly acid to medium acid in the Bath soil and very strongly acid or strongly acid in the Nassau soil.

Most areas of this complex are farmed, idle, or forested.

The soils in this complex can be used for some cultivated crops but are better suited to hay crops. Erosion is a serious hazard, particularly where slopes are long or are left bare of plant cover. Gravel fragments, mainly shale, limit tillage, and droughtiness is a problem in areas of shallow Nassau soil. Included areas of Rock outcrop limit the use of equipment. Minimum tillage, return of crop residue, cover crops, sod crops in the cropping system, and cross-slope tillage reduce the erosion hazard, conserve moisture, improve organic matter content, and promote tilth.

Early pasture produces fair yields in most years if it is reseeded regularly and adequately fertilized and limed. Droughtiness in midsummer reduces yields, particularly on the Nassau soil. Rotation grazing and proper stocking are needed to maintain desirable pasture plants.

Suitability for timber production is good to fair on the Bath soil and poor on the Nassau soil. Woodlots commonly are such species as sugar maple and northern red oak. Erosion hazard and equipment limitations are generally not problems. Seedling mortality and windthrow are serious hazards on the Nassau soil because of droughtiness and the shallow root zone. Logging trails across the slope prevent gullying or erosion along trails.

This soil complex is poorly suited to most urban uses because of slope, the shallowness over bedrock in the Nassau soil, and the slow or very slow permeability in the fragipan of the Bath soil. Depth to bedrock is a limitation for deep excavations, such as pipelines and basements, in the Bath soil. Some areas provide homesites, but careful selection is important. Excessive grading is to be avoided. Many areas are suitable for recreation uses such as paths and trails and picnic areas.

The capability subclass is IVe.

Ca—Canandaigua silt loam. This deep, nearly level, poorly drained and very poorly drained soil formed in glacial lake deposits dominated by clay, silt, and very fine sand. It occupies small depressions in uplands and broad flat lowland plains. The slope is mostly less than 2 percent, but in spots it is 3 percent. Areas are mainly oval and 5 to 50 acres.

Typically the surface layer is very dark gray silt loam 8 inches thick. The subsoil is 27 inches thick. The upper part is mottled very dark gray silt loam 12 inches thick. The lower part is mottled grayish brown silty clay loam 15 inches thick. The substratum from 35 to 60 inches is dark brown fine sand that is mottled in the upper part.

Included with this soil in mapping are spots of the somewhat poorly drained to poorly drained Raynham soils on slightly higher benches and small areas of very poorly drained gravelly Halsey soils near outwash terraces. Also included are small areas where the surface layer is mucky and a few spots of poorly drained and very poorly drained Madalin soils, which have a high clay content in the subsoil.

The water table in this Canandaigua soil is at or near the surface for prolonged periods. Some areas are ponded for brief periods in spring. Permeability is moderate or moderately slow in the surface layer and subsoil and moderately rapid in the substratum. Runoff is very slow, and available water capacity is high. Unless the soil is drained, roots are mostly confined to the upper 8 to 16 inches. Natural organic matter content is high. The upper part of the soil is generally gravel free but is as much as 3 percent rock fragments in some areas. The surface layer in unlimed areas is strongly acid to neutral.

Most areas are idle and support only the trees and shrubs that tolerate wetness. A few drained areas are farmed intensively, and some areas are pastured.

Unless drained, this soil is too wet for cultivated crops. If adequately drained, it can be farmed intensively to many crops, including vegetables. Drainage outlets are often difficult to establish because of the low position on the landscape. If outlets are available, a combination of open ditch and subsurface drains is generally effective. Minimum tillage, return of crop residue to the soil, cover crops, and tillage at the proper moisture content help to maintain a high organic matter content and promote good tilth. Some undrained areas provide sites for ponds, which can be used for irrigating adjacent better drained soils.

Partly drained areas can be productive pastureland. Grazing in wet periods compacts the soil and destroys desirable grasses.

Suitability for timber production is limited because of wetness. Trees such as red maple and white spruce are suited to this soil. Equipment limitation, seedling mortality, and windthrow hazard are serious problems. Machine planting of seedlings is difficult because of wetness.

This soil is generally not suited to urban uses because of prolonged wetness. In urban areas it often serves as natural open-space borders. Many areas are suited to the development of wildlife marshes or ponds for recreation. Seepage can be a problem if pond excavations are deep.

The capability subclass is IVw.

Cd—Carlisle muck. This deep, very poorly drained, nearly level soil formed in organic deposits 51 to 96 inches thick. It is in basins and depressions mainly in lowland lake plains and outwash plains. The organic material is from well decomposed woody and herbaceous plant remnants. This soil is drained. The slope is no more than 2 percent and is mostly less than 1 percent. Areas are commonly wide and oval and 10 to 100 acres.

Typically the surface layer is black muck 15 inches thick. Muck extends to a depth of 94 inches. The upper part is very dark gray, the middle part is dark brown, and the lower part is very dark gray. The mineral soil substratum, from 94 to 144 inches, is friable gray silt.

Included with this soil in mapping are small areas of very deep Carlisle muck that is more than 8 feet thick over mineral soil material and a few spots of Palms muck that is about 4 feet thick over mineral soil. Also included are poorly drained and very poorly drained Wayland soils and very poorly drained Wallkill soils on flood plains along a few streams that cross areas of this unit.

Although this soil is drained, it is still subject to occasional flooding and ponding in spring. The seasonal high water table is near the surface in spring but is lowered quickly through the drainage network once upland runoff subsides. Permeability is moderately slow to moderately rapid, depending on the degree of compaction and subsidence of the organic material. Runoff is very slow. Available water capacity is high. Depth of the root zone is limited to the level of the water table maintained by the drainage system. Natural organic matter content is very high. There are a few woody fragments in the upper part of the soil in some areas. The surface layer is medium acid to neutral.

Most areas are used intensively for special crops. A few areas are idle.

This soil is exceptionally well suited to vegetable crops such as onions, celery, and lettuce. It is also suited to sod crops for lawns. Cultivated crops associated with dairy farms, such as corn, do well on this soil. The principal management requirements are maintaining drainage systems and controlling wind erosion. Open ditches should be cleaned periodically because of side bank sloughing, filling from wind erosion, and deposition from flooding. Wind erosion can be controlled by vegetative or manmade windbreaks. Controlled drainage systems that regulate the depth of the water table reduce the problem of subsidence and decomposition of the organic material. Cover crops, minimum tillage, and tillage and harvest at the proper moisture content reduce soil compaction, promote tilth, and reduce the hazard of erosion.

This soil is generally poorly suited to pasture. Livestock puncture the surface, compacting the soil and destroying desirable plants.

Suitability for timber production is fair to poor. The trees are wet-tolerant species such as red maple, willow, and alder. Equipment limitation, seedling mortality, and windthrow hazard are very serious problems.

The hazard of flooding, the low strength, frost action potential, and poor trafficability are very serious limitations for urban use. Even in drained areas wetness is a problem in deep excavations. Some areas have potential for development as wetland wildlife marshes, but so long as the drainage system is maintained, the value for specialized crops remains high. The soil is a potential source of dried commercial organic material.

The capability subclass is IIIw.

Ce—Carlisle muck, very deep. This deep, very poorly drained, nearly level soil formed in organic deposits more than 96 inches thick. It is in the center of basins and depressions mainly in lowland plains. The organic deposit is from well decomposed woody and herbaceous plant remnants. This soil is drained. The slope is no more than 2 percent and is mostly less than 1 percent. Areas are commonly wide and oval and 10 to 100 acres.

Typically the surface layer is black muck 13 inches thick. Muck extends to a depth of 155 inches or more. The upper part is very dark gray, the middle part is dark brown, and the lower part is very dark gray.

Included with this soil in mapping are small areas of Carlisle muck that is less than 96 inches thick over mineral soil material and a few spots of Palms muck that is less than 51 inches thick over mineral soil. Also included are poorly drained and very poorly drained Wayland soils and very poorly drained Wallkill soils on flood plains along a few streams that cross this unit.

Although this Carlisle muck is drained, it is still subject to occasional flooding and ponding in spring. The seasonal high water table is near the surface in spring but is lowered quickly through the drainage network once upland runoff subsides. Permeability is moderately slow to moderately rapid, depending on the degree of compaction and subsidence of the organic material. Runoff is very slow, and available water capacity is high. Depth of the root zone is limited to the level of the water table maintained by the drainage system. Natural organic matter content is very high. There are few woody fragments in the upper part of the soil in some areas. Reaction in the surface layer is medium acid to neutral.

Most areas are intensively farmed. A few are idle.

This soil is exceptionally well suited to vegetable crops such as onions, celery, and lettuce. Sod crops for lawns

are also grown intensively. Corn and other crops needed on dairy farms do well on this soil. The principal management requirements are maintaining the drainage system and controlling wind erosion. Open ditches should be cleaned periodically because of side bank sloughing, filling from wind erosion, and deposition and siltation from flooding. Wind erosion can be controlled by vegetative or manmade windbreaks. Controlled drainage systems that regulate the depth of the water table reduce the problem of subsidence and decomposition of the organic material. Cover crops, minimum tillage, and tilling and harvesting at the proper moisture content reduce compaction, promote tilth, and reduce the hazard of wind erosion. Drained organic soils tend to be depleted under intensive cultivation as a result of subsidence and oxidation. Thus, this soil has a potentially longer life for cultivation than the Carlisle muck that is less than 8 feet thick over mineral soil deposits. Also, drainage systems in deep organic deposits function better than those placed in the mineral soil substratum of shallower organic soils.

This soil is generally poorly suited to pasture. Livestock puncture the surface, compacting the soil and destroying desirable plants.

Suitability for timber production is poor. Trees are wet-tolerant species such as red maple, willow, and alder. Equipment limitation, seedling mortality, and windthrow hazard are serious problems.

This soil is not suited to urban use because of the flood hazard, low strength, frost action potential, and poor trafficability. Even in drained areas, wetness is a problem in deep excavations. Some areas have potential for development as wetland wildlife marshes, but as long as the drainage system is maintained the value for specialized crops remains high. The soil is a potential source of dried commercial organic material.

The capability subclass is IIIw.

Cf—Carlisle muck, ponded. This deep, nearly level, very poorly drained soil formed in organic deposits more than 51 inches thick. It is in depressional swamps, bogs, and marshes in upland till plains and lowland lake plains. The organic material is from well decomposed woody and herbaceous plant remnants. The slope is no more than 2 percent and is mostly less than 1 percent. Areas are mostly round and 5 to 15 acres.

Typically the surface layer is black muck 10 inches thick. Muck extends to a depth of 106 inches. The upper part is very dark gray, the middle part is dark brown, and the lower part is very dark gray. The mineral soil substratum, from 106 to 132 inches, is friable, gray silt.

Included with this soil in mapping are small areas of Palms muck that is less than 51 inches thick over mineral soil. Also included are very poorly drained Alden soils in some fringe areas where mineral soil has been deposited, Canandaigua and Madalin soils in a few spots that are dominantly clayey and silty lake-laid deposits, and very poorly drained, gravelly Halsey soils in a few areas that are dominantly glacial outwash deposits.

This Carlisle soil is commonly subject to flooding or ponding in spring. The water table is at or near the surface most of the year. Permeability is moderately slow to moderately rapid. Runoff is ponded or very slow, and available water capacity is high. Roots are mainly limited to the surface layer because of the prolonged high water table. Natural organic matter content is very high. There are a few woody fragments in the upper part of the soil in some areas. The surface layer is medium acid to neutral.

Most areas of this soil are idle and support only the shrubs and trees that tolerate wetness.

This soil requires drainage if it is to be used for crops. If adequately drained, it is exceptionally well suited to high value vegetable crops as well as to general farm crops. Drainage outlets are often difficult to establish because of the very low position in the landscape. In some areas pumping may be required because of the poor outlets. A combination of open ditches and subsurface drains in a patterned layout is a desirable and efficient drainage system for this soil. Windbreaks planted at the edge of drained areas reduce the hazard of wind erosion. Cover crops, minimum tillage, wide equipment tires, and cultivation at the proper moisture content reduce compaction and preserve tilth. The potential of many areas for drainage is poor because of small size, poor accessibility, and low position in the landscape.

This soil is poorly suited to pasture. Livestock puncture the surface, compacting the soil and trampling desirable grasses. Reseeding and fertilizing are extremely difficult because of wetness and poor trafficability.

Suitability for timber production is poor. Trees are wet-tolerant species such as red maple, willow, and alder. Equipment limitation, seedling mortality, and windthrow are serious problems because of prolonged wetness.

This soil is not suited to urban uses because of flooding or ponding, prolonged wetness, low strength, frost action, and poor trafficability. Some areas are well suited to the development of wetland wildlife marshes.

The capability subclass is Vw.

CgA—Castile gravelly silt loam, 0 to 3 percent slopes. This deep, moderately well drained, nearly level soil formed in glacial outwash deposits that have a high content of gravel fragments. It is on low terraces in valleys and lowland plains. Most areas are long and narrow. Others are wide and oval. Most are about 5 to 15 acres.

Typically the surface layer is dark brown gravelly silt loam 9 inches thick. The subsoil is 20 inches thick. The upper part is brown very gravelly loam, and the lower part is mottled dark brown very gravelly loam. The upper part of the substratum, to a depth of 46 inches, is mottled brown gravelly silt loam. The middle part is dark brown gravelly silt loam. The lower part is dark brown very gravelly loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of somewhat poorly drained to poorly drained Fredon soils

in slight depressions. Somewhat excessively drained Hoosic soils and well drained to somewhat excessively drained Chenango soils are included on small knolls and slightly higher benches and terraces. Also included are spots of gently sloping Castile soils.

The water table rises into the subsoil for brief periods in spring. Permeability is moderately rapid in the subsoil and rapid or very rapid in the substratum. Runoff is slow, and available water capacity is moderate. Roots are restricted when the water table is seasonally high. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. Unless limed, the surface layer is very strongly acid to medium acid.

Most areas are farmed or are idle.

This soil is suited to many cultivated crops and to hay. Wetness delays cultivation somewhat longer than on nearby better drained soils, such as Hoosic and Chenango. The delay, however, is usually not long enough to justify an extensive drainage system. In many fields, earlier cultivation is possible if random subsurface drains can be extended to the areas of wetter included soils. This nearly level soil is easy to till, but gravel and small stones hinder some kinds of tillage and cause excessive wear of equipment. Cover crops, return of crop residue, fertilizer, minimum tillage, and an occasional sod crop in the cropping system are needed to maintain soil tilth and increase organic matter content. This soil is much easier to irrigate than the gently sloping Castile soil.

Pasture is usually productive on this soil. Rotation grazing, proper stocking, and restricted grazing in wet periods are needed to maintain desirable pasture plants.

Suitability for timber production is fair to good. Sugar maple, northern red oak, and black cherry are common. Equipment limitation, seedling mortality, and the hazard of erosion or windthrow are not serious problems. Machine planting of seedlings is feasible but can be slightly difficult because of the gravel fragments.

Seasonal wetness is a limitation for many urban uses. Properly designed drains around foundations of dwellings minimize this limitation. Because of the rapid or very rapid permeability in the substratum, pollution of the water table by septic effluent is a hazard. Some areas are suitable for recreation uses that require a nearly level site. Gravel fragments, however, may be a limitation for some uses.

The capability subclass is IIw.

CgB—Castile gravelly silt loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil formed in glacial outwash deposits that have a high content of gravel fragments. It is on low undulating terraces and concave foot slopes on lowland plains and along valley floors. Areas are generally long and narrow and about 5 to 10 acres.

Typically the surface layer is dark brown gravelly silt loam 9 inches thick. The subsoil is 19 inches thick. The upper part is brown very gravelly loam, and the lower part is mottled dark brown very gravelly loam. The upper part of the substratum, to a depth of 45 inches, is mottled brown gravelly silt loam. The middle part is dark brown gravelly silt loam. The lower part is dark brown very gravelly loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of somewhat poorly drained to poorly drained Fredon soils in slight depressions. Also included are somewhat excessively drained Hoosic soils and well drained to somewhat excessively drained Chenango soils on small knolls and slightly higher benches and terraces and spots of nearly level Castile soils.

The water table rises into the subsoil for brief periods in spring. Permeability is moderately rapid in the subsoil and rapid or very rapid in the substratum. Runoff is slow to medium, and available water capacity is moderate. Roots are restricted when the water table is seasonally high. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. Unless limed, the surface layer is very strongly acid to medium acid.

Most areas are farmed. Some are idle or wooded.

This soil is suited to many cultivated crops and to hay. Wetness delays cultivation somewhat longer than on nearby better drained soils, such as Hoosic and Chenango. The delay, however, is usually not long enough to justify an extensive drainage system. In many fields, earlier cultivation is possible if random subsurface drains can be extended to the areas of wetter included soils. Gravel fragments and small stones hinder some kinds of tillage and cause excessively fast wear of equipment. Erosion is a hazard, particularly on long slopes. Cross slope tillage where practical, cover crops, return of crop residue, fertilizer, minimum tillage, and an occasional sod crop in the cropping system help to control erosion, maintain tilth, and increase organic matter content. This soil is somewhat more difficult to irrigate than the nearly level Castile soil.

Pasture is productive on this soil. Rotation grazing, proper stocking, and restricted grazing in wet periods are needed to maintain desirable plants.

Suitability for timber production is fair to good. Sugar maple, northern red oak, and black cherry are common. Equipment limitation, seedling mortality, and the hazard of erosion or windthrow are not serious problems. Machine planting of seedlings is feasible but can be slightly difficult because of the gravel fragments.

Seasonal wetness is a limitation for many urban uses. Properly designed drains around foundations of dwellings minimize this limitation. Because of the rapidly or very rapidly permeable substratum, pollution of the water table by septic effluent is a hazard. Some areas are suitable for recreation uses such as picnic areas and camp areas.

The capability subclass is IIw.

ChB—Charlton fine sandy loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil

formed in glacial till deposits derived from schist and gneiss. It is on ridge crests, hilltops, and mountaintops in uplands. Areas are generally round and 5 to 15 acres.

Typically the surface layer is dark brown fine sandy loam 10 inches thick. The subsoil is 18 inches thick. The upper part is yellowish brown gravelly loam, and the lower part is yellowish brown gravelly sandy loam. The substratum to a depth of 60 inches is light olive brown gravelly sandy loam over light olive brown very gravelly sandy loam.

Included with this soil in mapping are areas of a well drained Paxton soil that has a fragipan. In a few large areas the surface is very stony. Pockets of Palms muck in a few deep depressions are identified by spot symbols on the soil map. Also included are a few areas of a somewhat poorly drained glacial till soil that has an extremely stony surface and areas of shallow Hollis soils on a few ridge crests.

Depth to the water table is more than 6 feet. Permeability is moderate to moderately rapid. Runoff is medium, and available water capacity is low to moderate. Roots are not restricted. Natural organic matter content is low. Gravel fragments make up 5 to 20 percent of the surface layer, and the content commonly increases in the subsoil. Unless limed, the surface layer is very strongly acid to medium acid.

Most areas of this soil are either forested or idle. Some are used for hay or pasture.

This soil is suitable for cultivated crops, small grain, and hay, but it occurs in many mountainous areas where accessibility is a problem and adjacent soils are poorly suited to farming. In areas where cultivation is possible, erosion is a slight hazard. Cross-slope tillage, cover crops, return of crop residue to the soil, and minimum tillage are needed to control erosion, conserve moisture, and promote tilth. Droughtiness is a hazard in many years.

This soil is well suited to pasture. Proper stocking, rotation grazing, and lime and fertilizer are needed to maintain desirable pasture plants.

Suitability for timber production is fair to good. Woodlots support such species as northern red oak and eastern white pine. Equipment limitation and the hazards of windthrow and erosion are not serious problems. Machine planting of seedlings is usually feasible. The hazard of summer droughtiness can be avoided by planting early in spring.

This soil is suited to most urban and recreation uses. Many areas provide excellent homesites. Limitations are minimal for recreation uses such as campsites, picnic areas, and paths and trails. Droughtiness can be a slight limitation for lawns and golf fairways.

The capability subclass is IIe.

ChC—Charlton fine sandy loam, 8 to 15 percent slopes. This deep, well drained, sloping soil formed in glacial till deposits derived from schist and gneiss. It is on ridges, hillsides, and upper mountainsides of the uplands. Areas are generally oval and 10 to 20 acres.

Typically the surface layer is dark brown fine sandy loam 9 inches thick. The subsoil is 16 inches thick. The upper part is yellowish brown gravelly loam, and the lower part is yellowish brown gravelly sandy loam. The substratum to a depth of 60 inches is light olive brown gravelly sandy loam over light olive brown very gravelly sandy loam.

Included with this soil in mapping are areas of the well drained Paxton soils that have a fragipan. In a few large areas the surface is very stony. Also included are moderately well drained and somewhat poorly drained soils similar to Charlton soils along a few drainageways and shallow Hollis soils on a few ridge crests.

Depth to the water table is more than 6 feet. Permeability is moderate to moderately rapid. Runoff is medium to rapid, and available water capacity is low to moderate. Roots are not restricted. Natural organic matter content is low. Gravel fragments make up 5 to 20 percent of the surface layer, and the content commonly increases in the subsoil. Unless limed, the surface layer is very strongly acid to medium acid.

Most areas of this soil are either forested or idle. Some are pastured.

This soil is moderately suited to cultivated crops, small grain, and hay, but it occurs in many mountainous areas where accessibility is a problem and adjacent soils are poorly suited to farming. Erosion is a hazard if this soil is cultivated intensively. Cross-slope tillage, cover crops, return of crop residue to the soil, stripcropping, sod crops in the cropping system, and minimum tillage are needed to control erosion, conserve moisture, and promote tilth. Droughtiness is a hazard in many years.

This soil is suited to pasture. Proper stocking, rotation grazing, and adequate lime and fertilizer are needed to maintain desirable pasture plants.

Suitability for timber production is fair. Woodlots support such species as northern red oak and eastern white pine. Equipment limitation and the hazard of windthrow or erosion are not serious problems. The hazard of summer droughtiness can be avoided by planting seedlings early in spring. Logging trails laid out across the slope reduce the risk of gullying and erosion.

This soil is suited to many urban and recreation uses. Slope is the principal limitation. Some areas have potential for dwellings, but careful site selection is needed. Lawns and golf fairways often deteriorate as a result of droughtiness in midsummer.

The capability subclass is IIIe.

CLC—Charlton-Paxton complex, extremely stony, sloping. These deep, well drained, gently sloping to sloping soils formed in glacial till deposits derived from schist and gneiss. They occur on hilltops, hillcrests, and mountainsides in uplands. The slope is mainly 8 to 15 percent but ranges from 3 to 15 percent. The surface layer is fine sandy loam, loam, or sandy loam and is commonly gravelly. Large stones and boulders are 3 to 5 feet apart on the surface. Areas are mostly oblong and 15 to 100 acres. The Paxton soil has a fragipan.

This complex is about 60 percent Charlton soil, 30 percent Paxton soil, and 10 percent other soils. Areas of Charlton and Paxton soils occur in such an intricate pattern that they were not mapped separately.

Typically the Charlton soil has a surface layer of dark brown fine sandy loam 9 inches thick. The subsoil is 16 inches thick. The upper part is yellowish brown gravelly loam, and the lower part is yellowish brown gravelly sandy loam. The substratum to a depth of 60 inches is light olive brown gravelly sandy loam over light olive brown very gravelly sandy loam.

Typically the Paxton soil has a thin decomposed leaf mat over a dark brown gravelly loam surface layer 4 inches thick. The subsoil is 19 inches thick. The upper part is strong brown gravelly loam, and the lower part is yellowish brown gravelly loam. The substratum from 23 to 60 inches is a firm grayish brown gravelly sandy loam fragipan.

Included with this complex in mapping are a few areas that are nearly free of large surface stones. Also included are small pockets of the very poorly drained Alden soil in a few depressions, a few very deep depressions of Palms muck and Carlisle muck, some areas where the surface layer is severely eroded, and a few areas of a somewhat poorly drained soil, in drainageways, that is similar to the Paxton soil.

In the Charlton soil, depth to the seasonal high water table is more than 6 feet. In the Paxton soil the water table is perched above the dense fragipan for brief periods early in spring. Permeability is moderate or moderately rapid in the Charlton soil. It is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the fragipan in the Paxton soil. Runoff is medium to rapid. Available water capacity is low to moderate in both soils. Root growth is not restricted in the Charlton soil but is restricted by the fragipan in the Paxton soil. Natural organic matter content is low in both soils. In addition to the large stones on the surface, the surface layer is 5 to 20 percent gravel fragments, and the content commonly increases in the subsoil. Unless limed, the surface layer ranges from very strongly acid to medium acid in both soils.

Most areas of this complex are either forested or idle.

This complex is not suited to cultivated crops or hay unless surface stones are removed. The feasibility of removing stones and trees depends on the accessibility of areas and on the kinds of soils in adjacent areas that would be cultivated with these soils. If areas are cleared, cross-slope tillage, cover crops, sod crops in the cropping system, and minimum tillage are needed to reduce the risk of erosion, conserve moisture, and improve tilth.

These soils can be used for pasture. Generally the quality of pasture is poor because large stones on the surface prevent reseeding and applying lime and fertilizer.

Suitability for timber is fair. Wooded areas support such trees as northern red oak, sugar maple, and white pine. The use of equipment is severely limited by the high content of surface stones. There is little hazard of erosion or windthrow.

The extremely stony surface and the slope are limitations for urban uses. Slow or very slow permeability in the fragipan of the Paxton soil is an additional limitation. Some areas can be used for paths and trails but partial clearing of stones is sometimes required. Many areas provide opportunities for improving wildlife habitat.

The capability subclass is VIIs.

CLD—Charlton-Paxton complex, extremely stony, moderately steep. This complex consists of deep, well drained soils that formed in glacial till deposits derived from schist and gneiss. These moderately steep to steep soils occur on hillsides and mountainsides of the uplands. The slope is mainly 15 to 25 percent but ranges from 15 to 35 percent. The surface layer, excluding large stones, is fine sandy loam, loam, or sandy loam and is commonly gravelly. Large stones and boulders are about 3 to 5 feet apart on the surface. Areas are mostly long and narrow and 15 to 50 acres. The Paxton soil has a fragipan.

This complex is about 60 percent Charlton soil, 30 percent Paxton soil, and 10 percent other soils. Areas of Charlton and Paxton soils occur in such an intricate pattern that they were not mapped separately.

Typically the Charlton soil has a surface layer of dark brown fine sandy loam 7 inches thick. The subsoil is 15 inches thick. The upper part is yellowish brown gravelly loam, and the lower part is yellowish brown gravelly sandy loam. The substratum to a depth of 60 inches is light olive brown gravelly sandy loam over light olive brown very gravelly sandy loam.

Typically the Paxton soil has a thin decomposed leaf mat over a dark brown gravelly loam surface layer that is 2 inches thick. The subsoil is 19 inches thick. The upper part is strong brown gravelly loam, and the lower part is yellowish brown gravelly loam. The substratum to a depth of 60 inches is a firm, grayish brown gravelly sandy loam fragipan.

Included with this complex in mapping are a few areas that are nearly free of large surface stones. Small pockets of very poorly drained Alden soils in a few depressions are identified by spot symbols on the soil maps. In some areas the surface layer is very severely eroded. Some drainageways include a somewhat poorly drained soil that is similar to the Paxton soil but wetter.

In the Charlton soil, depth to the water table is more than 6 feet. In the Paxton soil the water table is perched above the dense fragipan for brief periods in spring. Permeability is moderate or moderately rapid in the Charlton soil. In the Paxton soil it is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the fragipan. Runoff is rapid, and available water capacity is low to moderate in both soils. Roots are not restricted in Charlton soil but are restricted by the fragipan in Paxton soil. Natural organic matter content is low in both soils. Excluding the large stones on

the surface, gravel fragments make up 5 to 20 percent of the surface layer, and the content commonly increases in the subsoil. In unlimed areas, reaction in the surface layer of both soils ranges from very strongly acid to medium acid.

Most areas are either forested or idle.

This complex is not suited to cultivated crops or to hay because of the large stones on the surface and the moderately steep slopes. It is generally not practical to remove stones for crop production because of the continuing slope limitation and the poor accessibility of most areas. If stones are removed, this soil complex is better suited to hay crops than to cultivated crops.

Some areas can be used for pasture. Generally pasture is of poor quality because of midsummer droughtiness and the difficulty of reseeding and applying lime and fertilizer. Rotation grazing and proper stocking are needed to maintain desirable plants.

Suitability for timber production is fair. Woodlots support such species as northern red oak, sugar maple, and white pine. The use of equipment is seriously limited because of the high content of surface stones and the slope. Machine planting of seedlings is not feasible. Erosion is a hazard, particularly where logging trails are not laid out across the slope.

This complex is poorly suited to urban uses because of the extremely stony surface and the slope. Slow or very slow permeability in the fragipan of the Paxton soil is an additional limitation. Some areas can be used for paths and trails, but partial clearing of stones may be necessary. Many areas provide opportunities for improvement of wildlife habitat.

The capability subclass is VIIs.

CnA—Chenango gravelly silt loam, 0 to 3 percent slopes. This deep, well drained to somewhat excessively drained, nearly level soil formed in glacial outwash deposits that have a high gravel content. It is on terraces along valley floors and on broad lowland plains. Areas are mostly oblong and 5 to 10 acres.

Typically the surface layer is very dark grayish brown gravelly silt loam 7 inches thick. The subsoil is 23 inches thick. The upper part is yellowish brown very gravelly silt loam, and the lower part is dark brown very gravelly loam. The substratum to a depth of 60 inches is loose, dark grayish brown stratified sand and gravel.

Included with this soil in mapping are small areas of somewhat excessively drained Hoosic soils that are similar but have a higher sand content. Also included are moderately well drained Castile soils on slightly lower benches, somewhat poorly drained to poorly drained Fredon soils in a few concave areas and slight depressions, and a few areas where the surface layer is gravel free.

Depth to the water table is usually more than 6 feet. Permeability is moderate to moderately rapid in the surface layer and subsoil and rapid in the substratum. Runoff is slow, and available water capacity is low to moderate. Root penetration is excellent and is generally unrestricted. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. Unless limed, the surface layer is very strongly acid or strongly acid.

Most areas are used for farming or urban development.

This soil is well suited to cultivated crops, small grain, and hay (fig. 4). Droughtiness is a slight problem in midsummer in most years. Cover crops, minimum tillage, return of crop residue, and sod crops in the cropping system promote tilth and increase organic matter content. Increasing organic matter content improves available water capacity. Although the soil can be cultivated intensively, gravel fragments are slightly bothersome for some kinds of tillage and cause excessive wear of machinery. Erosion is generally not a hazard. This nearly level soil is easier to irrigate than the more sloping Chenango soils.

Pastures on this soil are fair in quality, but midsummer droughtiness retards growth. Proper stocking, rotation grazing, and lime and fertilizer are needed to maintain desirable plants and improve production.

Suitability for timber production is good. Woodlots support such species as sugar maple and northern red oak. Equipment limitation, erosion hazard, and windthrow hazard are not problems. Gravel fragments can be slightly bothersome in the machine planting of seedlings. Planting early in spring reduces the number of seedlings lost as a result of midsummer droughtiness.

This soil is suited to many urban and recreation uses. Most areas provide excellent homesites. Pollution of the water table by septic effluent is a hazard because of the rapidly permeable substratum. Gravel fragments and droughtiness are limitations in establishing lawns, golf fairways, and athletic fields. Some areas are suitable for camp areas and picnic areas.

The capability subclass is IIs.

CnB—Chenango gravelly silt loam, 3 to 8 percent slopes. This deep, well drained to somewhat excessively drained, gently sloping soil formed in glacial outwash deposits that have a high gravel content. It is on undulating terraces along valley floors and on plains. Areas are mostly oblong and 10 to 15 acres.

Typically the surface layer is very dark grayish brown gravelly silt loam 6 inches thick. The subsoil is 22 inches thick. The upper part is yellowish brown very gravelly silt loam, and the lower part is dark brown very gravelly loam. The substratum to a depth of 60 inches is loose, dark grayish brown stratified sand and gravel.

Included with this soil in mapping are small areas of somewhat excessively drained Hoosic soils that are similar but have a higher sand content. Also included are moderately well drained Castile soils on slightly lower benches, somewhat poorly drained to poorly drained

Figure 4.—Intensively cropped Chenango gravelly silt loam, 0 to 3 percent slopes. Urban development on Mardin gravelly silt loam, 3 to 8 percent slopes.

Fredon soils in a few concave areas and slight depressions, and a few areas where the surface layer is gravel free.

Most areas of this soil are used for farming or urban development.

Depth to the water table is usually more than 6 feet. Permeability is moderate to moderately rapid in the surface layer and subsoil and rapid in the substratum. Runoff is slow to medium. Available water capacity is low to moderate. Root penetration is excellent and is generally unrestricted. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. Unless limed, the surface layer is very strongly acid or strongly acid.

This soil is well suited to cultivated crops, small grain, and hay. Droughtiness is a problem in midsummer in most years. Erosion is a slight hazard, particularly on long slopes. Cover crops, minimum tillage, return of crop residue, and sod crops in the cropping system are needed to control erosion, promote tilth, and increase organic matter content. Increasing organic matter content improves available water capacity. The soil is easy to till, but gravel fragments are slightly bothersome in some kinds of tillage and cause excessive wear of machinery. This gently sloping soil is somewhat more difficult to irrigate than the nearly level Chenango soil.

Pastures are generally of fair quality, but midsummer droughtiness hinders growth. Proper stocking, rotation grazing, and lime and fertilizer are needed to maintain desirable plants and improve production.

Suitability for timber production is good. Woodlots support such species as sugar maple and northern red oak. Equipment limitations and the hazard of erosion or windthrow are not serious problems. Gravel fragments can be slightly bothersome in the machine planting of seedlings. Planting early in spring reduces the number of seedlings lost as a result of midsummer droughtiness.

This soil is suited to many urban and recreation uses. Most areas provide excellent homesites. Pollution of the water table by septic effluent is a hazard because of the rapidly permeable substratum. Gravel fragments and droughtiness are limitations in establishing lawns, golf fairways, and athletic fields. Some areas are suitable for camp areas and picnic areas.

The capability subclass is IIs.

CnC—Chenango gravelly silt loam, 8 to 15 percent slopes. This deep, well drained to somewhat excessively drained, sloping soil formed in glacial outwash deposits high in gravel content. It is on terraces, along valley

floors, and on low rounded hills on plains. Areas are mostly long and narrow on terraces and oval or round on plains. Commonly areas are 5 to 20 acres.

Typically the surface layer is very dark grayish brown gravelly silt loam 5 inches thick. The subsoil is 21 inches thick. The upper part is yellowish brown very gravelly silt loam, and the lower part is dark brown very gravelly loam. The substratum from 26 to 60 inches is loose, dark grayish brown stratified sand and gravel.

Included with this soil in mapping are small areas of somewhat excessively drained Hoosic soils and excessively drained Otisville soils. Both of these soils have a higher sand content than this Chenango soil. In a few areas, the surface layer is eroded. In a few included areas there are no gravel fragments in the surface layer, and in others the surface layer is more than 35 percent gravel fragments. Moderately well drained Castile soils are included in concave areas between rounded hills.

Depth to the water table is usually more than 6 feet. Permeability is moderate to moderately rapid in the surface layer and subsoil and rapid in the substratum. Runoff is medium to rapid, and available water capacity is low to moderate. Root penetration is excellent and is generally unrestricted. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. Unless limed, the surface layer is very strongly acid or strongly acid.

Most areas of this soil are either farmed or idle.

This soil can be used for cultivated crops and small grain, but it is generally better suited to hay and pasture. Erosion is a serious hazard, and droughtiness is a problem in midsummer in most years. Cover crops, minimum tillage, return of crop residue, and cross-slope tillage reduce erosion, promote tilth, and increase organic matter content. Increasing organic matter content improves available water capacity. Cross-slope tillage is impractical on irregular slopes. Gravel fragments cause excessive wear of machinery.

This soil is suited to pasture, but midsummer droughtiness restricts growth. Proper stocking, rotation grazing, and lime and fertilizer are needed to maintain desirable pasture plants and improve production.

Suitability for timber production is good. Woodlots support such species as sugar maple and northern red oak. Equipment limitation and the windthrow hazard are not serious problems. The hazard of trailside gullying is reduced if logging trails are laid out across the slope. Seedling loss as a result of midsummer droughtiness can be reduced by planting early in spring.

This soil is somewhat limited for urban and recreation uses because of slope. A few areas provide suitable homesites, but careful site selection is needed. Proper design of septic tank absorption fields is essential because of slope and the hazard of pollution of the water table. Gravel fragments and droughtiness are limitations in establishing lawns and golf fairways. Some areas are good sources of gravel.

The capability subclass is IIIe.

CoB—Collamer silt loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil formed in glacial lake deposits that have a high content of silt and very fine sand. It is on benches, ridges, and undulating areas on lowland plains and in some valleys. The areas are mostly oval or round and 5 to 10 acres.

Typically the surface layer is brown silt loam 6 inches thick. The subsoil is 29 inches thick. The upper 4 inches is yellowish brown silt loam; the next 2 inches is dark yellowish brown silt loam with thin leached coatings of grayish brown; the middle 16 inches is mottled light olive brown heavy silt loam; and the lower 7 inches is mottled olive brown heavy silt loam. The substratum from 35 to 60 inches is firm, dark brown layers of very fine sand and silt.

Included with this soil in mapping are a few areas of the somewhat poorly drained Rhinebeck soils and poorly drained to very poorly drained Madalin soils on nearly level foot slopes, along drainageways, and in concave depressions. Also included are spots of the well drained Unadilla soils on a few higher convex knolls where the clay content is lower than in Collamer soils and a few small areas where bedrock is within 40 inches of the surface.

The water table rises into the subsoil early in spring and other excessively wet periods. Permeability is moderate in the surface layer and moderately slow in the subsoil and substratum. Runoff is medium to slow, and available water capacity is high. Roots are generally restricted only by the seasonal high water table. Natural organic matter content is low. The soil is generally gravel free, but some layers are as much as 3 percent gravel fragments. The surface layer is strongly acid to neutral.

Most areas of this soil are farmed.

This gravel-free soil is easy to till once it dries in spring. Cultivation begins somewhat later than on adjacent better drained soils because of wetness. The soil is suited to cultivated crops, small grain, hay, and nursery stock. Many areas are suited to vegetable crops that do not require early spring planting. Erosion is a serious hazard, particularly on long slopes or in areas left bare of a plant cover. Cross-slope tillage, cover crops, minimum tillage, return of crop residue, sod crops, and tillage at the proper moisture content reduce the erosion hazard, preserve tilth, and improve organic matter content.

This soil is well suited to pasture grasses. Grazing in wet periods compacts the soil and destroys desirable plants. Rotation grazing, proper stocking, and restricted grazing in wet periods are needed to maintain pasture seedings.

Suitability for timber production is good. The few remaining forested areas support such species as sugar maple, northern red oak, and white ash. Equipment limitation and the hazards of erosion and windthrow are generally not problems.

Seasonal wetness and moderately slow permeability are limitations for many urban and recreation uses. Frost

action and the tendency of excavation walls to slump or cave are also serious hazards for some uses. Properly designed and installed drains around foundations of dwellings minimize the wetness limitation. Some areas are suited to camp areas, picnic areas, paths and trails, and lawns or golf fairways.

The capability subclass is IIe.

CoC—Collamer silt loam, 8 to 15 percent slopes. This deep, moderately well drained, sloping soil formed in glacial lake deposits that have a high content of silt and very fine sand. It is on the sides of ridges, on hillsides, and in rolling areas on lowland plains and in some valleys. Areas are mostly oval and 5 to 15 acres.

Typically the surface layer is brown silt loam 6 inches thick. The subsoil is 27 inches thick. The upper 3 inches is yellowish brown silt loam; the next 2 inches is dark yellowish brown silt loam with thin, leached grayish brown coatings; the middle 15 inches is mottled light olive brown heavy silt loam; and the lower 7 inches is mottled olive brown heavy silt loam. The substratum from 33 to 60 inches is firm, dark brown layers of very fine sand and silt.

Included with this soil in mapping are a few areas of the somewhat poorly drained Rhinebeck soils and poorly drained to very poorly drained Madalin soils on foot slopes, along drainageways, and in concave depressions. Also included are spots of well drained Unadilla soils on a few higher convex knolls, and a few spots of moderately well drained Scio soils where gravelly layers are within 40 inches of the surface. In some areas the surface layer is eroded.

The water table rises into the subsoil early in spring and other excessively wet periods. Permeability is moderate in the surface layer and moderately slow in the subsoil and substratum. Runoff is medium to rapid, and available water capacity is high. Roots are generally restricted only by the seasonal high water table. Natural organic matter content is low. The soil is generally gravel free and is no more than 3 percent gravel fragments. The surface layer is strongly acid to neutral.

Most areas of this soil are either farmed or idle.

This soil can be used for cultivated crops but is better suited to small grain, hay, and pasture. Erosion is a very serious hazard, particularly on long slopes or in areas left bare of a plant cover. Where cultivated crops are grown, cross-slope tillage, stripcropping, cover crops, minimum tillage, a high proportion of sod forming crops in the cropping system, and return of crop residue are desirable in reducing the serious erosion hazard. These practices also preserve tilth and improve organic matter content. Early spring cultivation is somewhat delayed because of wetness. Once this gravel-free soil dries in spring, it is fairly easy to till.

Pasture grasses are well suited to this soil. Grazing in wet periods compacts the soil and causes loss of desirable plants. Rotation grazing, proper stocking, and restricted grazing when the soil is wet are needed to maintain the pasture seeding.

Suitability for timber production is good. Forested areas are sugar maple, northern red oak, and white ash. Equipment limitation and windthrow hazard are not generally problems. Erosion along logging trails is a hazard unless trails are laid out across the slope.

Temporary wetness, moderately slow permeability, and slope are limitations for many urban and recreation uses. Frost action and the tendency of excavation walls to slump or cave are also serious hazards for some uses. Excavations or cuts in foot slope areas can cause massive slides or slumps. Lawns and golf fairways are well suited to this soil.

The capability subclass is IIIe.

CoD—Collamer silt loam, 15 to 25 percent slopes. This deep, moderately well drained, moderately steep soil formed in glacial lake deposits that have a high silt and very fine sand content. It is on the sides of ridges and hillsides and in rolling hilly areas on lowland plains and in some valleys. Areas are mostly long and narrow. A few are wide and oval and have complex slopes. Most are about 5 to 10 acres.

Typically the surface layer is brown silt loam 4 inches thick. The subsoil is 24 inches thick. The upper 3 inches of the subsoil is yellowish brown silt loam; the next 2 inches is dark yellowish brown silt loam with thin, leached coatings of grayish brown; the middle 13 inches is mottled light olive brown heavy silt loam; and the lower 6 inches is mottled olive brown heavy silt loam. The substratum from 28 to 60 inches is firm, dark brown layers of very fine sand and silt.

Included with this soil in mapping are a few areas of the somewhat poorly drained Rhinebeck soils on foot slopes and along drainageways, spots of well drained Unadilla soils on a few higher convex areas, and moderately well drained Scio soils in a few spots where gravelly layers are within 40 inches of the surface. Some included areas are very severely eroded, and in a few spots the original surface layer has been completely washed away.

The water table rises into the subsoil early in spring and other excessively wet periods. Permeability is moderate in the surface layer and moderately slow in the subsoil and substratum. Runoff is rapid, and available water capacity is high. Roots are generally restricted only by the seasonal high water table. Natural organic matter content is low. The soil is generally gravel free and is no more than 3 percent gravel fragments. The surface layer is strongly acid to neutral.

Most areas are idle, pastured, or forested.

This soil is suited to only a few cultivated crops. It is better suited to pasture. The hazard of erosion is very serious in cultivated areas, and slope is a limitation for some tillage and harvesting equipment. Cultivated crops should be grown infrequently and under maximum conservation measures, including stripcropping, minimum tillage, and cover crops. Some areas are suited to hay crops, but the operation of equipment is somewhat difficult and hazardous.

This soil is suited to pasture. Erosion is a hazard if areas are overgrazed or grazed when the soil is wet. Proper stocking, rotation grazing, and restricted grazing in wet periods are needed to maintain pasture seedings and control erosion.

Suitability for timber production is good. Forested areas support such trees as sugar maple, northern red oak, and white ash. Equipment limitation and the hazard of erosion are serious problems. Erosion along skid trails can result in deep gullies that prevent the use of the trails. If logging trails and roads are laid out across the slope, this risk is reduced.

This soil is poorly suited to most urban and recreation uses because of slope. Seasonal wetness, moderately slow permeability and the hazard of frost action are additional limitations for many uses. Walls of excavations for underground utilities and basements tend to slough and cave. Excavation of foot slope areas is hazardous because of the danger of mass slides and slumps.

The capability subclass is IVe.

Du—Dumps. These miscellaneous areas consist mostly of excavations that have been filled or are being filled with refuse and trash. In some areas the refuse is dumped in natural low spots with little accompanying excavation, but more commonly a series of trenches dug by backhoe or bulldozer serve as the dump site. Often the refuse is partly covered or mixed with earthy material. The sides of areas are steep, and the floor is nearly level or undulating piles of trash and debris. Areas are mostly irregular or rectangular in shape, depending on topography and ownership boundaries, and are commonly 3 to 15 acres.

The refuse varies widely in degree of decomposition. In some places it is relatively undecomposed. In other areas it is well decomposed or partly burned. In addition to organic wastes, such as garbage, paper, and wood, the refuse commonly contains bottles, cans, wire, slabs of asphalt, bricks, tires, old appliances, and parts of cars. Some areas of decomposing rubbish emit a sulfurlike odor. Rodent infestation is a common problem.

Included in mapping are small pools of water in some of the dumps. In some large areas the soil material covering the debris and rubbish is up to 5 feet thick.

Dumps are generally devoid of vegetation except for scattered bushes and grass in open areas. The earthy floor in excavated areas is often highly compacted, allowing slow infiltration of rainwater. The depth and degree of compaction of the refuse are highly variable.

Abandoned dumps can be difficult to reclaim for farming or timber production. Large quantities of earthy fill and extensive grading are generally needed to adequately landscape areas for tillage and planting. Large amounts of organic matter and fertilizer are needed to make reclaimed areas productive.

Most areas, even if properly landscaped, are not suitable for urban uses because of the hazard of subsidence. Subsidence results from the settling and decomposition of the buried trashy material. Pungent odors and health hazards can be detrimental for some recreation uses. Onsite investigation is essential to determine the suitability of abandoned dumps for any use.

Pollution of streams, ponds, or ground water by liquid wastes and effluent seeping from dump sites is a hazard in some areas.

No capability subclass is assigned.

ErA—Erie gravelly silt loam, 0 to 3 percent slopes. This deep, somewhat poorly drained, nearly level soil has a fragipan. It formed in glacial till deposits derived from shale, slate, and sandstone. It occurs as broad, nearly flat hilltops and foot slopes of the uplands. Areas are mainly round or oval and 5 to 10 acres.

Typically the surface layer is dark brown gravelly silt loam 10 inches thick. The subsoil is 46 inches thick. It is mottled grayish brown channery silt loam in the upper 8 inches and is a firm, mottled olive brown channery silt loam fragipan in the lower part. The substratum from 56 to 70 inches is mottled olive brown channery silt loam.

Included with this soil in mapping are small areas of the moderately well drained Mardin soils on slightly higher rises and knolls and very poorly drained Alden soils in a few small depressions. On a few acres there are large stones on the surface.

The seasonal high water table in this Erie soil is perched above the fragipan in spring and other wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the fragipan and the substratum. Runoff is slow, and available water capacity is moderate to low. Roots are restricted by the dense fragipan to depths of 10 to 24 inches. Natural organic matter content is medium. The soil layers above the pan are 15 to 35 percent gravel or channery fragments. Unless limed, the surface layer ranges from very strongly acid to medium acid.

Most areas are either idle or pastured. A few are used for hay and cultivated crops.

This soil can be used for cultivated crops but is generally better suited to hay or pasture. Unless the soil is drained, wetness delays planting in spring and often interferes with harvesting in fall. The soil is somewhat difficult to drain because of slow water movement through the fragipan. A combination of subsurface drains, interceptor drains, and open ditch drains is often essential for adequate drainage. Subsurface drains may require backfilling with gravel to be effective. This soil is somewhat more difficult to drain than the gently sloping Erie soil. Minimum tillage, cover crops, and sod crops in the cropping system are needed to preserve soil tilth and maintain organic matter content.

Pasture on this soil is generally fair to good in quality. Grazing in wet periods compacts the soil and destroys desirable grasses. Rotation grazing, proper stocking, lime and fertilizer, and restricted grazing in wet periods are needed to maintain pasture seedings.

Suitability for timber production is fair to good. Forested areas support such trees as black cherry, sugar maple, and northern red oak. Windthrow and seedling mortality are minor hazards because of the restricted root depth. Wetness can be a problem in machine planting of seedlings in spring.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for most urban and recreation uses. Some areas are excellent sites for dugout ponds or small marshes for wetland wildlife.

The capability subclass is IIIw.

ErB—Erie gravelly silt loam, 3 to 8 percent slopes. This deep, somewhat poorly drained, gently sloping soil has a fragipan. It formed in glacial till deposits derived from shale, slate, and sandstone. It is on foot slopes, on lower hillsides, and along shallow drainageways of the uplands. It commonly receives runoff from higher adjacent soils. Areas are mainly oval and 5 to 20 acres.

Typically the surface layer is dark brown gravelly silt loam 9 inches thick. The subsoil is 45 inches thick. It is mottled grayish brown channery silt loam in the upper 9 inches and a firm, mottled olive brown channery silt loam fragipan in the lower part. The substratum from 54 to 70 inches is mottled olive brown channery silt loam.

Included with this soil in mapping are small areas of the moderately well drained Mardin soils on slightly higher rises and knolls and very poorly drained Alden soils on a few small concave toe slopes. On a few acres there are large stones on the surface.

The water table in this Erie soil is perched above the fragipan in spring and other wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the pan and substratum. Runoff is medium, and available water capacity is moderate to low. Roots are restricted by the dense pan to depths of 10 to 24 inches. Natural organic matter content is medium. The soil layers above the fragipan are 15 to 35 percent gravel or channery fragments. Unless limed, the surface layer ranges from very strongly acid to medium acid.

Most areas of this soil are either idle or pastured. A few are used for hay and cultivated crops.

This soil can be used for cultivated crops but is better suited to hay or pasture. Unless the soil is drained, wetness delays planting in spring and often hinders harvesting in fall. This soil is somewhat difficult to drain because of slow water movement through the fragipan. A combination of subsurface drains and interceptor drains is often essential for adequate drainage. Subsurface drains may require backfilling with gravel to be effective. This soil is usually easier to drain than the nearly level Erie soil. Erosion is a hazard, particularly on long slopes and in intensively cultivated areas. Minimum tillage, cover crops, cross slope tillage, and sod crops in the cropping system are needed to preserve tilth, control erosion, and maintain organic matter content.

This soil is fairly well suited to pasture. Grazing in wet periods compacts the soil and destroys desirable grass species. Rotation grazing, proper stocking, lime and fertilizer, and restricted grazing in wet periods are needed to maintain pasture seedings.

Suitability for timber production is fair to good. Forested areas support such species as black cherry, sugar maple, and northern red oak. Windthrow and seedling mortality are minor hazards because of the restricted root zone. Seasonal wetness can be a problem in machine planting of seedlings in spring.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for most urban and recreation uses. Many areas provide excellent sites for dike ponds.

The capability subclass is IIIw.

ESB—Erie extremely stony soils, gently sloping. These deep, somewhat poorly drained, gently sloping soils have a fragipan. They formed in glacial till deposits derived from shale, slate, and sandstone. They are on lower hillsides, foot slopes, and hilltops and along shallow drainageways of the uplands. The slope ranges from 3 to 8 percent. Stones and boulders more than 10 inches in diameter and less than 5 feet apart cover the surface. Texture of the surface layer, excluding large stones, is gravelly silt loam, gravelly loam, or gravelly fine sandy loam. Areas are mostly round and 5 to 15 acres.

Typically the surface layer is dark brown gravelly silt loam 4 inches thick. Large stones are at the surface. The subsoil is 46 inches thick. It is mottled grayish brown channery silt loam in the upper 14 inches. The lower part is a firm, mottled olive brown fragipan. The substratum from 50 to 70 inches is mottled olive brown channery silt loam.

Included with these soils in mapping are small areas of moderately well drained Mardin soils on slightly higher rises and knolls and very poorly drained Alden soils on a few small concave toe slopes. Some small areas have very few if any large stones on the surface.

The water table is perched above the fragipan in spring and other wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the fragipan and substratum. Runoff is medium. Available water capacity is moderate to low. Roots are restricted by the dense fragipan. Natural organic matter content is medium. The soil layers above the pan are 15 to 35 percent gravel or channery fragments. Unless limed, the surface layer ranges from very strongly acid to medium acid.

Most areas are either idle or forested. A few are unimproved pasture.

These soils are not suited to most cultivated crops or hay because of the large stones on the surface. Drainage is required for optimum crop production if large stones are removed. Where drainage and removal of stones are feasible, cross-slope tillage, cover crops, sod crops in the cropping system, and minimum tillage are needed to maintain tilth and organic matter content and reduce erosion.

Pasture on these soils is generally of poor quality. The large stones on the surface make reseeding and applying lime and fertilizer impractical. Rotation grazing and restricted grazing in wet periods are needed to maintain pasture seedings and reduce the hazard of erosion.

Suitability for timber production is fair. Forested areas support such trees as black cherry, sugar maple, and northern red oak. Machine planting of seedlings is usually not practical because of the large stones on the surface. Windthrow and seedling mortality are slight hazards because of the restricted root zone.

Large stones on the surface, seasonal wetness, and slow or very slow permeability in the fragipan are serious limitations for most urban and recreation uses. Some areas provide excellent pond sites, but removal of surface stones may be necessary before construction begins.

The capability subclass is VIIs.

FAC—Farmington silt loam, sloping. This shallow, well drained, sloping and gently sloping soil formed in glacial till deposits derived from limestone, shale, slate, and siltstone. It is on hillcrests, ridges, and knolls cored with bedrock in the uplands. The slope ranges from 1 to 15 percent but is dominantly 8 to 15 percent. Areas are mainly oval and 10 to 20 acres.

Typically the surface layer is dark grayish brown silt loam 8 inches thick. The subsoil is yellowish brown silt loam 11 inches thick. Hard, gray limestone bedrock is at a depth of 19 inches.

Included with this soil in mapping are small areas of deep, well drained Pittsfield soils and some areas of a soil that is similar to Farmington soil but is moderately deep over bedrock. A few spots of very poorly drained Alden soils and organic Palms soils in depressions are identified by spot symbols on the soil map. A few small areas of exposed bedrock are also included.

There is usually no perched water table above the jointed and fractured bedrock. Permeability is moderate. Available water capacity is low or very low. Runoff is medium to rapid. Bedrock, generally limestone or limy shale, is at a depth of 10 to 20 inches. Roots are restricted by bedrock, but a few penetrate along cracks and fractures in the rock. Natural organic matter content is low. The surface layer is 5 to 15 percent gravel or chert fragments. The surface layer ranges from strongly acid to slightly acid in unlimed areas.

Most areas are farmed, forested, or idle.

This soil can be used for cultivated crops but is better suited to hay or pasture. Shallowness over bedrock, droughtiness, erosion hazard, and slope are limitations for cultivated crops. This soil can be tilled early in spring. Early season crops or short season crops are desirable to avoid midsummer droughtiness. Erosion is a very serious hazard if cultivated slopes are long. Cross-slope tillage, cover crops, sod crops in the cropping system, and minimum tillage reduce the risk of erosion and promote tilth.

This soil is suited to pasture grasses, but droughtiness in midsummer retards growth. Proper stocking, rotation grazing, and restricted grazing when the soil is wet or extremely dry are needed to maintain pasture seedings. Erosion is a hazard in overgrazed areas.

Suitability for timber production is fair to poor. Forested areas support such trees as sugar maple and northern red oak. Summer droughtiness retards growth of most species. Seedling mortality and windthrow are serious hazards.

Suitability for urban uses is limited by shallowness over bedrock. Excavation is very difficult because of the hardness of the rock. Because of solution cavities in the bedrock, pollution of the underground water supply by septic effluent is a very serious hazard. Some areas have potential for quarries or recreation trails.

The capability subclass is IVe.

Fd—Fredon loam. This deep, somewhat poorly drained and poorly drained, nearly level soil formed in glacial outwash deposits that have a high content of sand and gravel. It is on low terraces and outwash plains along valley floors and in lowlands. The slope is no more than 3 percent. Areas are mostly round or oval and commonly 5 to 10 acres.

Typically the surface layer is dark grayish brown loam 6 inches thick. The subsoil is 18 inches thick. The upper part is mottled grayish brown very fine sandy loam; the middle part is mottled light yellowish brown very fine sandy loam; and the lower part is mottled brown fine sandy loam. The substratum from 24 to 60 inches is grayish brown stratified gravelly sand.

Included with this soil in mapping are spots of very poorly drained Halsey soils in depressions and a few higher benches of moderately well drained Castile soils. Fredon and Castile soils formed in similar deposits. Also included in a few small areas are Raynham soils, which have a deep silty mantle.

The water table rises into the upper part of the subsoil in spring and other excessively wet periods. Permeability is moderate in the surface layer, moderately slow or slow in the subsoil, and moderately rapid or rapid in the substratum. Runoff is slow. Available water capacity is moderate. Roots are restricted only by the seasonal high water table. Organic matter content is medium. The surface layer and subsoil are 3 to 35 percent gravel fragments. Reaction in the surface layer is medium acid to neutral.

Many areas are in hay or pasture. Some areas are forested or idle. A few are cultivated.

Undrained areas are suited to pasture and some hay crops. Unless the soil is drained, suitability for cultivated crops is poor because tillage is delayed in spring. If the soil is drained, it is productive of many crops. Subsurface drains and open ditch drains function well if suitable outlets are available. Minimum tillage, cover crops, tillage at the proper moisture content, and sod crops in the cropping system are needed to maintain organic matter content and tilth.

Pasture seedings do fairly well on this soil, but grazing when the soil is wet compacts the soil and destroys desirable grasses. Proper stocking and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is fair to good. Forested areas support such trees as northern red oak and red maple. Windthrow and high seedling mortality are hazards. Machine planting of seedlings is somewhat difficult in spring because of wetness.

The seasonal high water table is a limitation for many urban and recreation uses. Careful design and installation of drainage systems are important for dwellings or other structures. Some areas provide good sites for dugout ponds.

The capability subclass is IIIw.

Ha—Halsey silt loam. This deep, very poorly drained, nearly level soil formed in glacial outwash deposits. It is in depressions and concave areas on low terraces along valley floors and on nearly flat plains in lowland areas. The substratum has a high content of sand and gravel derived from shale, slate, and gneiss. The slope is 0 to 3 percent. Areas are mostly round and 5 to 10 acres.

Typically the surface layer is very dark grayish brown silt loam 6 inches thick. The subsoil is 16 inches thick. The upper part is mottled gray silt loam; the middle part is mottled light olive gray silt loam; and the lower part is mottled light gray silt loam. The upper part of the substratum, from 22 to 26 inches, is loose, dark gray stratified sand and gravel. The lower part is loose, very dark gray stratified sand and gravel to a depth of 60 inches or more.

Included with this soil in mapping are somewhat poorly drained and poorly drained Fredon soils on a few slightly higher benches and rises. Also included are a few areas where the surface layer is gravelly.

The water table is at or near the surface for prolonged periods, and many areas are ponded for brief periods in spring. Permeability is moderate in the surface layer, moderate or moderately slow in the subsoil, and moderately rapid to rapid in the substratum. Runoff is very slow. Available water capacity is moderate to high. In undrained areas roots are confined to a depth of 8 to 14 inches because of the high water table. Natural organic matter content is high. The surface layer and subsoil are as much as 30 percent gravel fragments. The surface layer is medium acid to neutral.

Most areas are idle. The natural vegetation is water-tolerant grasses, shrubs, and trees.

This soil is poorly suited to most crops because of prolonged wetness. The low position in the landscape makes drainage outlets difficult to establish. If drainage is feasible, the soil is suitable for some crops commonly grown. Drainage generally requires a combination of both open ditch and subsurface drains. If this soil is used for crops, minimum tillage, cover crops, and sod crops in the crop rotation are needed to maintain organic matter content and tilth.

If partial drainage is feasible, this soil can be used for pasture. Grazing in wet periods compacts the soil and destroys desirable grasses. Rotation grazing and restricted grazing in wet periods are needed.

Wetness limits suitability for timber producton. Forested areas support such species as red maple, white oak, and eastern hemlock. Windthrow and high seedling mortality are serious hazards. Prolonged wetness seriously limits the use of equipment.

This soil is poorly suited to most urban and recreation uses because of wetness. Areas near urban centers often serve as natural open-space corridors. Many areas are suitable for the development of wildlife marshes or dugout ponds for recreation.

The capability subclass is IVw.

HH—Histic Humaquepts, ponded. This map unit, commonly called freshwater marsh, is deep, very poorly drained, level mineral soils capped with a thin layer of organic soil material. Areas are ponded throughout most of the year and commonly border large streams, rivers, ponds, and other open bodies of water. The soils formed in various kinds of material, including glacial till, lacustrine, outwash, and alluvial deposits. Most areas are natural depressions, but a few have been created by man or by beaver dams. The slope is no more than 1 percent. Areas are generally small and round and 5 to 10 acres.

Typically the surface is covered with 1 to 6 inches of water. The surface layer is black organic material, muck, 4 to 16 inches thick. Under the surface layer are gray to dark grayish brown mineral subsoil layers ranging from mucky silty clay to gravelly loamy sand 4 to 20 inches thick. The substratum to a depth of 60 inches or more varies greatly in both color and texture.

Included in mapping are a few spots of very poorly drained Alden soils on slightly higher areas and a few small areas of soils that do not have the organic surface layer.

Most areas support water-tolerant herbaceous plants, such as cattails, rushes, lily pads, and marsh grass. The only trees are near the edges of areas where the water is very shallow.

These soils vary greatly in texture, gravel and stone content, permeability, reaction, and other characteristics. Onsite investigation is essential in determining feasibility for all farm and nonfarm uses that require better drained conditions. In most places these freshwater marshes are extremely difficult to drain because the water level is controlled by adjacent bodies of open water.

Most areas provide excellent habitat for wetland wildlife, including beaver, muskrat, fish, and waterfowl. In some areas, constructing islands and nesting boxes and planting food-producing wetland shrubs improve the wildlife habitat.

The capability subclass is VIIIw.

HLC—Hollis soils, sloping. These shallow, well drained to somewhat excessively drained, sloping and

gently sloping soils formed in glacial till deposits derived from crystalline rock that is dominantly schist, gneiss, and granite. This map unit is on hillcrests, hilltops, valley sides, and ridges of the mountainous uplands. The slope is dominantly 8 to 15 percent but ranges from 3 to 15 percent. The surface layer is loam, fine sandy loam, or sandy loam and is commonly gravelly. Areas are mostly oblong and 10 to 100 acres.

Typically the surface layer is dark brown gravelly loam 8 inches thick. The subsoil is strong brown gravelly loam 10 inches thick. Hard, gray granitic bedrock is at a depth of 18 inches.

Included with these soils in mapping are small areas of the well drained Charlton and Paxton soils where the soil mantle is thicker than 5 feet and some areas of soils that are similar to Hollis soils but are 20 to 60 inches deep over rock. A few spots where rock crops out are identified by spot symbols on the soil map. Also included are a few small depressions of very poorly drained Alden soils or organic Palms soils. Some nearly level areas are included.

There is usually no perched water table above the bedrock. Where the bedrock is poorly jointed, water remains above the rock for brief periods early in spring. Permeability is moderate or moderately rapid. Available water capacity is very low or low. Runoff is medium to rapid. Bedrock is at a depth of 10 to 20 inches. Roots are restricted by bedrock, but a few penetrate along fractures and cracks in the rock. Natural organic matter content is low. The soil is 2 to 25 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas are either idle or forested. A few are pastured or used for hay.

Shallowness over bedrock, areas of rock outcrop, and droughtiness seriously limit suitability for most crops. Some areas are suited to pasture and hay crops, but yields are generally low because of droughtiness. These soils can be tilled early in spring. If areas are cultivated, early season crops or short season crops are desirable because of summer droughtiness. Erosion is a serious hazard in cultivated areas. It can be controlled by cross-slope tillage, cover crops, minimum tillage, and sod crops. These practices also improve tilth and increase organic matter content.

Pasture grasses can be grown on these soils, but growth is restricted because of lack of moisture in most years. Proper stocking, rotation grazing, lime and fertilizer, and restricted grazing in dry periods are needed to maintain desirable pasture grasses.

Suitability for timber production is poor because of the shallowness over bedrock and associated droughtiness. Forested areas support such species as northern red oak, eastern white pine, and sugar maple. High seedling mortality and windthrow are hazards.

These soils are poorly suited to most urban and recreation uses because of the shallowness over bedrock and associated dryness. Deep excavation is very difficult as a result of the hardness of the underlying rock. Many areas provide suitable trails for hiking and horseback riding. A few areas provide sites for structures without basements, but careful site selection is needed.

The capability subclass is IVe.

HLD—Hollis soils, moderately steep. These shallow, well drained to somewhat excessively drained, moderately steep and steep soils formed in glacial till deposits derived from crystalline rock that is dominantly schist, gneiss, and granite. They are on hillsides, valley sides, and ridges of mountainous uplands. The slope is dominantly 15 to 25 percent but ranges from 15 to 35 percent. The surface layer is loam, fine sandy loam, or sandy loam and is commonly gravelly. Areas are mostly oblong and 10 to 100 acres.

Typically the surface layer is dark brown gravelly loam 5 inches thick. The subsoil is strong brown gravelly loam 10 inches thick. Hard, gray granitic bedrock is at a depth of 15 inches.

Included with these soils in mapping are small areas of the well drained Charlton and Paxton soils where the soil mantle is thicker than 5 feet and some large areas of soils that are similar to Hollis soils but are 20 to 60 inches deep over rock. A few spots of Rock outcrop are identified by symbols on the soil map. Also included are a few small depressions of very poorly drained Alden soils or organic Palms soils.

There is usually no perched water table above the bedrock. Where the bedrock is poorly jointed, water remains above the rock for brief periods early in spring. Permeability is moderate or moderately rapid. Available water capacity is very low or low. Runoff is rapid. Bedrock is at a depth of 10 to 20 inches. Roots are restricted by bedrock, but a few penetrate along fractures and cracks in the rock. Natural organic matter content is low. The soil is 2 to 25 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas are either idle or forested. A few are pastured or used for hay crops.

These soils are generally not suitable for most crops because of slope, shallowness over bedrock, outcrops of rock, and droughtiness. Hay crops can be grown in some areas, but reseeding and harvesting are difficult because of slope and a few ledges where rock crops out. Because erosion is a very serious hazard in areas left bare of plant cover, nurse crops or cover crops should accompany new seedings. Applications of lime and fertilizer are needed for optimum production of hay.

These soils can be used for pasture, but growth is poor in many years because of droughtiness. Proper stocking, rotation grazing, lime and fertilizer, and restricted grazing in dry periods are needed to maintain desirable pasture grasses.

Suitability for timber production is poor because of the shallowness over bedrock and associated droughtiness. Forested areas support such species as northern red

oak, eastern white pine, and sugar maple. High seedling mortality and windthrow are hazards. Slope limits the use of equipment.

These soils are not suited to most urban and recreation uses because of the slope and shallowness over bedrock. Deep excavation is difficult because of the hardness of the rock. Some areas are suitable for trails or ski slopes.

The capability subclass is VIe.

HoA—Hoosic gravelly sandy loam, 0 to 3 percent slopes. This deep, somewhat excessively drained, nearly level soil formed in glacial outwash deposits that have a high content of sand and gravel. It is on terraces and broad flat areas along valley floors and on lowland plains. Areas are mostly round or oval and about 5 to 15 acres.

Typically the surface layer is dark grayish brown gravelly sandy loam 6 inches thick. The subsoil is 25 inches thick. The upper 6 inches is yellowish brown gravelly sandy loam, the next 12 inches is yellowish brown very gravelly sandy loam, and the lower 7 inches is yellowish brown very gravelly loamy sand. The substratum to a depth of 60 inches or more is loose, light olive brown very gravelly sand.

Included with this soil in mapping are spots of well drained Chenango soils, which have a higher silt content than this Hoosic soil. Also included are spots of the sandy Oakville soils in a few small areas and pockets of the moderately well drained Castile soils and somewhat poorly drained to poorly drained Fredon soils in slight depressions and along drainageways. A few included areas are gently sloping.

Depth to the water table is usually more than 6 feet. Permeability is moderately rapid in the surface layer, moderately rapid or rapid in the subsoil, and very rapid in the substratum. Available water capacity is low. Runoff is slow. Root penetration is excellent and is generally restricted only if moisture is inadequate. Natural organic matter content is low. Gravel fragments make up 15 to 50 percent of the surface layer, and the content commonly increases with depth. Unless limed, the surface layer is strongly acid or very strongly acid.

Most areas are farmed. Some are used for urban development and recreation.

This soil is suited to cultivated crops, small grain, and hay if moisture is available. Droughtiness in midsummer is commonly a problem that reduces yields. The soil warms up rapidly in spring and is suited to early cultivation. Short season crops or early season crops are needed to avoid summer droughtiness. Gravel and cobbles can be bothersome for some kinds of tillage and cause excessively rapid wear of machinery. Minimum tillage, cover crops, return of crop residue, and sod crops in the cropping system are needed to maintain tilth, increase organic matter content, and improve the available water capacity.

This soil is suited to pasture, but lack of moisture in midsummer results in poor growth. Grazing early in spring is practical. Rotation grazing, restricted grazing in dry periods, proper stocking, and lime and fertilizer are needed to maintain desirable pasture grasses.

Suitability for timber production is fair to good. Woodlots contain such species as sugar maple and northern red oak. Seedlings should be planted early in spring when plenty of moisture is available. Machine planting of seedlings is feasible, but gravel fragments can slightly hinder planting.

This soil is suited to many urban and recreation uses. Properly designing and installing septic tank absorption fields minimize the hazard of pollution of the water table. Gravel fragments and droughtiness are limitations in establishing and maintaining lawns and golf fairways. Some nearly level areas are suitable for athletic fields, but gravel fragments can be bothersome in establishing seedings.

The capability subclass is IIIs.

HoB—Hoosic gravelly sandy loam, 3 to 8 percent slopes. This deep, somewhat excessively drained, gently sloping soil formed in glacial outwash deposits that have a high content of sand and gravel. It is on terraces and undulating areas along valley floors and on lowland plains. Areas are mostly round or oval and about 10 to 20 acres.

Typically the surface layer is dark grayish brown gravelly sandy loam 6 inches thick. The subsoil is 22 inches thick. The upper 5 inches is yellowish brown gravelly sandy loam; the next 11 inches is yellowish brown very gravelly sandy loam; and the lower 6 inches is yellowish brown very gravelly loamy sand. The substratum to a depth of 60 inches or more is loose, light olive brown very gravelly sand.

Included with this soil in mapping are spots of well drained Chenango soils that have a higher silt content than this Hoosic soil. Also included are spots of the sandy Oakville soils in a few small areas and pockets of the moderately well drained Castile soils and somewhat poorly drained to poorly drained Fredon soils in slight depressions and along drainageways. A few included areas are nearly level.

Depth to the water table is usually more than 6 feet. Permeability is moderately rapid in the surface layer, moderately rapid or rapid in the subsoil, and very rapid in the substratum. Available water capacity is low. Runoff is slow. Root penetration is excellent and is generally unrestricted if moisture is adequate. Natural organic matter content is low. Gravel fragments make up 15 to 50 percent of the surface layer, and the content commonly increases with increasing depth. Unless limed, the surface layer is strongly acid or very strongly acid.

Most areas are farmed. Some are used for urban development and recreation.

This soil is suited to cultivated crops, small grain, and hay, but droughtiness is a problem in midsummer. Crop yields are commonly poor because of the lack of moisture. This soil warms up rapidly in spring and is suited to

early cultivation. Short season or early season crops are needed to avoid summer droughtiness. Gravel and cobbles can be bothersome for some kinds of tillage and cause excessively rapid wear of machinery. Erosion is a slight hazard, particularly on long slopes. Minimum tillage, cover crops, return of crop residue, cross-slope tillage, and sod crops in the cropping system are needed to maintain tilth, reduce the erosion hazard, increase organic matter content, and improve available water capacity. This soil is somewhat more difficult to irrigate than the nearly level Hoosic soils.

The soil is suited to pasture, but lack of moisture in midsummer often results in poor growth. Grazing early in spring is practical. Rotation grazing, restricted grazing in dry periods, proper stocking, and applications of lime and fertilizer are needed to maintain desirable grasses.

Suitability for timber production is fair to good. Woodlots support such species as sugar maple and northern red oak. Seedlings should be planted early in spring when plenty of moisture is available. Machine planting of seedlings is feasible, but gravel fragments can slightly hinder planting.

Pollution of the water table by septic effluent is a hazard because of the very rapidly permeable substratum. Careful design and installation of septic tank absorption fields minimize this hazard. Gravel fragments and droughtiness are limitations in establishing and maintaining lawns and golf fairways.

The capability subclass is IIIs.

HoC—Hoosic gravelly sandy loam, 8 to 15 percent slopes. This deep, somewhat excessively drained, sloping soil formed in glacial outwash deposits that have a high content of sand and gravel. It is on low rounded hills, on ridges, and along the fronts of terraces in valleys and on lowland plains. Areas are mostly oblong and 10 to 50 acres.

Typically the surface layer is dark grayish brown gravelly sandy loam 5 inches thick. The subsoil is 20 inches thick. The upper 4 inches is yellowish brown gravelly sandy loam, the next 10 inches is yellowish brown very gravelly sandy loam, and the lower 6 inches is yellowish brown very gravelly loamy sand. The substratum to a depth of 60 inches or more is loose, light olive brown very gravelly sand.

Included in mapping are spots of well drained Chenango soils that have a higher silt content than this Hoosic soil. Also included are a few spots of the sandy Oakville soils and pockets of the moderately well drained Castile soils and somewhat poorly drained to poorly drained Fredon soils in slight depressions and lower drainageways. A few included areas are moderately steep, and a few spots are eroded.

Depth to the water table is usually more than 6 feet. Permeability is moderately rapid in the surface layer, moderately rapid or rapid in the subsoil, and very rapid in the substratum. Available water capacity is low. Runoff is medium. Root penetration is excellent and is generally restricted only if moisture is inadequate. Natural organic matter content is low. Gravel fragments make up 15 to 50 percent of the surface layer, and the content commonly increases with increasing depth. Unless limed, the surface layer is strongly acid or very strongly acid.

Most areas are either farmed or idle. A few are used for urban and recreation purposes.

This soil can be used for cultivated crops, small grain, and hay, but midsummer droughtiness and erosion are hazards. Crop yields are often reduced because of the lack of moisture. Erosion is a particular hazard on long slopes and in areas left bare of plant cover. The soil warms up rapidly in spring and is suited to early cultivation. Short season crops or early season crops are needed to avoid the hazard of summer droughtiness. Gravel and cobbles cause excessively rapid wear of machinery. Minimum tillage, cover crops, return of crop residue, and a high proportion of sod crops in the cropping system reduce the erosion hazard, increase organic matter content, and improve available water capacity.

This soil is suited to pasture, but lack of moisture in midsummer results in poor growth. Grazing early in spring is practical. Rotation grazing, restricted grazing in dry periods, proper stocking, and lime and fertilizer are needed to maintain desirable grasses.

Suitability for timber production is fair to good. Woodlots support such species as sugar maple and northern red oak. Seedlings should be planted early in spring when plenty of moisture is available. Machine planting of seedlings is feasible, but gravel fragments can slightly hinder planting.

This soil can be used for many urban and recreation purposes, but slope is a limitation for some uses. Some areas provide homesites, but careful site selection is needed. Pollution of the water table by effluent from septic tank absorption fields is a hazard because of the very rapidly permeable substratum. Lawns and golf fairways are somewhat difficult to establish because of droughtiness. Some areas provide good sites for gravel pits.

The capability subclass is IVs.

HoD—Hoosic gravelly sandy loam, 15 to 25 percent slopes. This deep, somewhat excessively drained, moderately steep soil formed in glacial outwash deposits that have a high content of sand and gravel. It is on the sides of terraces and on low rounded hills and ridges in valleys and on lowland plains. Areas are mostly oblong and 10 to 50 acres.

Typically the surface layer is dark grayish brown gravelly sandy loam 5 inches thick. The subsoil is 18 inches thick. The upper 3 inches is yellowish brown gravelly sandy loam, the next 10 inches is yellowish brown very gravelly sandy loam, and the lower 5 inches is yellowish brown very gravelly loamy sand. The substratum to a depth of 60 inches or more is loose, light olive brown very gravelly sand.

Included in mapping are spots of well drained Chenango soils that have a higher silt content than this

Hoosic soil. Also included are a few spots of the sandy Oakville soils and pockets of the moderately well drained Castile soils and the somewhat poorly drained to poorly drained Fredon soils in slight depressions. A few included areas are steep. Some are severely eroded.

Depth to the water table is usually more than 6 feet. Permeability is moderately rapid in the surface layer, moderately rapid or rapid in the subsoil, and very rapid in the substratum. Available water capacity is low. Runoff is rapid. Root penetration is excellent and is generally restricted only if moisture is inadequate. Natural organic matter content is low. Gravel fragments make up 15 to 50 percent of the surface layer, and the content commonly increases with increasing depth. Unless limed, the surface layer is strongly acid or very strongly acid.

Most areas are either idle or forested. Some are farmed.

This soil can be used for cultivated crops but it is better suited to hay or pasture. Erosion is a serious hazard. The moderately steep slopes make the operation of equipment somewhat difficult and hazardous. Midsummer droughtiness is a problem, and gravel fragments are bothersome for some kinds of tillage. Cultivation should be infrequent and under maximum conservation measures. Cross-slope tillage, return of crop residue, minimum tillage, and cover crops reduce the erosion hazard and increase organic matter content. Stripcropping is not practical where the slopes are irregular and complex.

This soil is suited to pasture, but lack of moisture in midsummer results in poor growth. Grazing early in spring is practical. Rotation grazing, restricted grazing in dry periods, proper stocking, and lime and fertilizer are needed to maintain desirable grasses. Reseeding is somewhat difficult on the steep slopes.

Suitability for timber production is fair. Woodlots support such species as sugar maple or northern red oak. Seedlings should be planted early in spring when plenty of moisture is available. Machine planting of seedlings is feasible, but gravel fragments and slope hinder planting.

This soil is poorly suited to most urban and recreation uses because of slope. Some areas are suitable for hiking paths and horse trails. Many areas are a potential source of sand and gravel.

The capability subclass is IVe.

LdB—Lordstown channery silt loam, 3 to 8 percent slopes. This moderately deep, well drained, gently sloping soil formed in glacial till deposits derived from sandstone and some shale and slate. It is on upland hilltops and ridges. Areas are long and oval and commonly 10 to 40 acres.

Typically the surface layer is very dark grayish brown channery silt loam 8 inches thick. The subsoil is 30 inches thick. The upper part is yellowish brown channery loam, and the lower part is light olive brown channery loam. The bedrock, starting at 38 inches, is brown sandstone.

Included with this soil in mapping are small areas of the shallow, somewhat excessively drained to moderately well drained Arnot soils. Also included are a few spots of the deep, well drained to moderately well drained Swartswood soils and moderately well drained to somewhat poorly drained Wurtsboro soils. Pockets of very poorly drained Alden soils in a few depressions are identified by spot symbols on the soil map. A few areas are nearly level.

There is usually no perched water table above the bedrock in spring. Permeability is moderate. Available water capacity is moderate to low, and runoff is slow to medium. Depth to bedrock ranges from 20 to 40 inches. Roots are restricted. Natural organic matter content is low. The soil is 15 to 35 percent gravel or channery fragments. In unlimed areas, the surface layer is very strongly acid to slightly acid.

Most areas are either idle or forested. A few are used for pasture and crops.

This soil is suited to cultivated crops, but depth to bedrock and midsummer droughtiness can limit crop yields. Some areas are better suited to hay. Erosion is a hazard, particularly on long slopes. Channery or gravel fragments are bothersome for some tillage and planting and cause excessively rapid wear of equipment. Remoteness and poor accessibility are additional problems to cultivation of some areas. Where cultivated crops are grown, cross-slope tillage, cover crops, minimum tillage, and sod crops in the cropping system are needed to reduce erosion, maintain tilth, increase organic matter content and improve available water capacity.

Pasture grasses are suited to this soil, but growth can be slow in midsummer because of droughtiness. Proper stocking, lime and fertilizer, and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is good to fair. Woodlots commonly are such species as northern red oak, sugar maple, and white ash. Equipment limitations are few. Channery fragments can be a slight problem for planting equipment. Erosion and seedling mortality are generally not problems. Seedlings should be planted early in spring to avoid midsummer droughtiness.

Depth to bedrock is a serious limitation for many urban uses. Deep excavation and installation of septic tank absorption fields are difficult because of the hardness of the rock. Some areas provide good sites for picnic areas, campsites, and hiking trails.

The capability subclass is IIe.

LdC—Lordstown channery silt loam, 8 to 15 percent slopes. This moderately deep, well drained, sloping soil formed in glacial till deposits derived from sandstone and some shale and slate. It is on upland hillsides, valley sides, and ridges. Areas are dominantly long and narrow and 5 to 15 acres.

Typically the surface layer is very dark grayish brown channery silt loam 6 inches thick. The subsoil is 26 inches thick. The upper part is yellowish brown channery loam, and the lower part is light olive brown channery loam. The bedrock, starting at 32 inches, is brown sandstone.

Included with this soil in mapping are small areas of the shallow, somewhat excessively drained to moderately well drained Arnot soils. A few spots of the deep, well drained to moderately well drained Swartswood soils and moderately well drained to somewhat poorly drained Wurtsboro soils are also included. Pockets of very poorly drained Alden soils in a few depressions and along drainageways are identified by spot symbols on the soil map. A few included areas are gently sloping. Some are moderately steep.

There is usually no perched water table above the bedrock in spring. Permeability is moderate. Available water capacity is moderate to low, and runoff is rapid. Depth to bedrock ranges from 20 to 40 inches. Roots are restricted. Natural organic matter content is low. The soil is 15 to 35 percent gravel or channery fragments. In unlimed areas, the surface layer is very strongly acid to slightly acid.

Most areas are either idle or forested. A few are used for pasture and hay.

This soil can be used for cultivated crops but generally is better suited to hay or pasture. The hazard of erosion, the moderate depth to bedrock, and midsummer droughtiness are limitations for crops. Erosion is a particularly serious hazard on long slopes or in areas bare of plant cover. Channery or gravel fragments are bothersome for some kinds of tillage and cause excessively rapid wear of equipment. The remoteness and poor accessibility of many areas are additional limitations. In cultivated areas, cross-slope tillage, stripcropping, cover crops, minimum tillage, and a high proportion of sod crops in the cropping system reduce erosion and increase organic matter content, which improves available water capacity.

Pasture grasses are suited to this soil, but midsummer droughtiness causes slow growth in some years. Proper stocking, lime and fertilizer, and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is good to fair. Woodlots commonly support such species as northern red oak, sugar maple, and white ash. There are few equipment limitations. Channery fragments can be slightly bothersome in machine planting of seedlings. Erosion is generally not a problem, but logging trails should be laid out across the slope to avoid gullying along the trails. Seedlings should be planted early in spring to avoid midsummer droughtiness.

Depth to bedrock and the slope are serious limitations for many urban uses. Deep excavation and the installation of septic tank absorption fields are difficult because of the hardness of the rock. Some areas provide good sites for picnic areas, campsites, and hiking trails, but site selection is important because of slope.

The capability subclass is IIIe.

Ma—Madalin silt loam. This deep, poorly drained and very poorly drained, nearly level soil formed in glacial lake deposits of silt and clay. It is on flats and in depressions on lowland lake plains and in small basins in uplands. Areas are commonly round and concave and 5 to 15 acres.

Typically the surface layer is black silt loam 8 inches thick. The subsurface layer is mottled dark gray silt loam 2 inches thick. The subsoil is 28 inches thick. It is greenish gray heavy silty clay loam that is mottled in the upper 7 inches. The substratum to a depth of 60 inches is firm, dark gray silty clay.

Included with this soil in mapping are the somewhat poorly drained Rhinebeck soils on a few slightly higher benches. Also included are a few spots of poorly drained and very poorly drained Canandaigua soils where the clay content is lower than in the Madalin soil. In a few spots the surface layer is gravelly.

The water table is at or near the surface for prolonged periods during the year. Some areas are ponded for brief periods in spring. Permeability is moderately slow in the surface layer, slow in the subsoil, and slow or very slow in the substratum. Available water capacity is high, and runoff is very slow. In undrained areas, roots are mostly confined to the surface layer and upper few inches of the subsoil. The soil is generally gravel free. Natural organic matter content is high. The surface layer is strongly acid to mildly alkaline.

Most areas are idle and support only the grasses, shrubs, and trees that tolerate wetness.

This soil is poorly suited to most crops because of prolonged wetness. Drainage systems are often difficult to install because of lack of suitable outlets and slow water movement through the subsoil. Close spacing of subsurface drains and open ditch drains is required. If this soil is drained and used for cultivated crops, minimum tillage, cover crops, sod crops in the cropping system, and tillage at the proper moisture content are needed to maintain tilth and organic matter content. Tilth is somewhat difficult to maintain because of the high clay content.

If partial drainage is feasible, this soil can be used for pasture. Bedding improves surface drainage. Grazing in wet periods compacts the soil and destroys desirable grasses. Rotation grazing and restricted grazing when the soil is wet prolong the life of pasture seedings.

Wetness limits suitability for timber production. Species such as red maple, white ash, and white spruce, however, will grow on this soil. Windthrow and seedling mortality are major hazards, and the use of equipment is severely limited.

This soil is poorly suited to most urban and recreation uses because of prolonged wetness and slow or very slow permeability. Some areas provide excellent sites for dugout ponds or wildlife marshes. Low strength is a problem in constructing roads and buildings.

The capability subclass is IVw.

MdB—Mardin gravelly silt loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil formed in glacial till deposits derived from sand-

stone shale, and slate. It has a dense fragipan in the subsoil. It is on broad divides, hilltops, and ridges in uplands. Areas are mostly round and 10 to 15 acres.

Typically the surface layer is dark brown gravelly silt loam 8 inches thick. The upper 7 inches of the subsoil is yellowish brown gravelly silt loam. The next 5 inches is a leached layer of mottled pale brown gravelly silt loam. Extending from 20 to 60 inches is a firm, olive brown channery silt loam fragipan.

Included with this soil in mapping are small areas of the somewhat poorly drained Erie soils in concave spots, on foot slopes, and along drainageways. The well drained Bath soils are included on a few higher knolls and ridges. Spots of the very poorly drained Alden soils in a few depressions are identified by spot symbols on the soil map.

The water table in this Mardin soil is perched above the fragipan early in spring and in other excessively wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the fragipan and substratum. Available water capacity is moderate to low, and runoff is slow to medium. Roots are restricted by the dense fragipan, but a few penetrate along vertical cracks in the pan. Natural organic matter content is low. The surface layer and upper part of the subsoil are 15 to 35 percent gravel fragments. In unlimed areas, the surface layer is extremely acid to slightly acid.

Many areas are farmed. Some are urbanized, idle, or forested.

This soil is suited to cultivated crops, small grain, and hay. Seasonal wetness slightly delays tillage and planting in spring. Random subsurface drains to included wet spots and interceptor drains that divert runoff from higher adjacent soils improve many fields. Erosion is a hazard on long slopes, and gravel fragments are slightly bothersome in planting and harvesting. Because the fragipan restricts root penetration, droughtiness is also a problem in some years. Cross-slope tillage, cover crops, minimum tillage, tillage at the proper moisture content, and sod crops in the cropping system reduce erosion, promote tilth, and increase organic matter content, which improves available water capacity.

This soil is suited to pasture. Grazing in wet periods, however, compacts the soil and destroys desirable grasses. Proper stocking, rotation grazing, restricted grazing in wet periods, and lime and fertilizer are needed to maintain pasture seedings.

Suitability for timber production is fair to good. Woodlots support such trees as sugar maple, northern red oak, and black cherry. Windthrow, high seedling mortality, erosion hazard, and equipment limitation are not major problems.

Seasonal wetness and slow or very slow permeability in the pan are limitations for many urban uses. Carefully designed and installed drains around foundations are needed to overcome the risk of damage from wetness in spring. Some areas are suitable for campsites, picnic areas, and dike ponds. Gravel fragments, however, can be bothersome for some recreation uses.

The capability subclass is IIw.

MdC—Mardin gravelly silt loam, 8 to 15 percent slopes. This deep, moderately well drained, sloping soil formed in glacial till deposits derived from sandstone, shale, and slate. It commonly receives runoff from higher adjacent soils. It has a dense fragipan in the lower part of the subsoil. It is on valley sides, hillsides, and ridges in uplands. Areas are mostly oval and 10 to 50 acres.

Typically the surface layer is dark brown gravelly silt loam 7 inches thick. The upper 6 inches of the subsoil is yellowish brown gravelly silt loam. The next 5 inches is a leached layer of mottled pale brown gravelly silt loam. Extending from 18 to 60 inches is a firm, olive brown channery silt loam fragipan.

Included with this soil in mapping are small areas of the somewhat poorly drained Erie soils on foot slopes and along drainageways. Also included are well drained Bath soils on a few higher knolls and ridges. A few spots are severely eroded, and in a few areas large stones are on the surface.

The water table is perched above the fragipan early in spring and in other excessively wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the pan and substratum. Available water capacity is moderate to low, and runoff is medium. Roots are restricted by the dense pan, but a few penetrate along vertical cracks in the pan. Natural organic matter content is low. The surface layer and upper part of the subsoil are 15 to 35 percent gravel fragments. In unlimed areas, the surface layer is extremely acid to slightly acid.

Some areas of this soil are used in farming, particularly for pasture. Others are idle or forested. A few are urbanized.

This soil is moderately suited to cultivated crops, small grain, and hay. Erosion is a serious hazard, particularly on long slopes, or in areas bare of plant cover. Seasonal wetness slightly delays tillage in spring. Interceptor drains that divert runoff from higher adjacent soils improve many fields. Gravel fragments are slightly bothersome in planting. Droughtiness is a hazard in some years because of the restricted root zone. Cross-slope tillage, stripcropping, diversion ditches, cover crops, minimum tillage, and sod crops in the cropping system reduce the erosion hazard, promote tilth, and increase organic matter content. Increasing organic matter content improves available water capacity.

This soil is suited to pasture. Grazing in wet periods, however, compacts the soil and destroys desirable grasses. Proper stocking, rotation grazing, restricted grazing in wet periods, and lime and fertilizer are needed to maintain pasture seedings.

Suitability for timber production is fair to good. Woodlots support such species as sugar maple, northern red oak, and black cherry. Windthrow, high seedling mortality, erosion hazard, and equipment limitation are not major problems. Slope and gravel fragments are minor problems for machine planting of seedlings.

Seasonal wetness, slope, and slow or very slow permeability in the fragipan are limitations for many urban uses. Carefully designed and installed drains around foundations are needed to overcome the risk of damage from wetness in spring and to intercept lateral seepage across the top of the pan. Slope and gravel fragments are minor limitations for many recreation uses. Some areas are suitable for campsites, hiking trails, and picnic areas.

The capability subclass is IIIe.

MdD—Mardin gravelly silt loam, 15 to 25 percent slopes. This deep, moderately well drained, moderately steep soil formed in glacial till deposits derived from sandstone, shale, and slate. It has a dense fragipan in the lower part of the subsoil. This soil is on hillsides and valley sides in uplands. Areas are mostly long and narrow and 5 to 30 acres.

Typically the surface layer is dark brown gravelly silt loam 6 inches thick. The upper 6 inches of the subsoil is yellowish brown gravelly silt loam. The next 4 inches is a leached layer of mottled pale brown gravelly silt loam. Extending from 16 to 60 inches is a firm, olive brown channery silt loam fragipan.

Included with this soil in mapping are small areas of the somewhat poorly drained Erie soils on foot slopes and along drainageways. Also included are the well drained Bath soils on a few upper side slopes. Some included areas are severely eroded, and in a few areas large stones are on the surface.

The water table is perched above the fragipan early in spring and in other excessively wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the fragipan and substratum. Available water capacity is moderate to low, and runoff is rapid. Roots are restricted by the dense fragipan, but a few penetrate along vertical cracks in the pan. Natural organic matter content is low. The surface layer and upper part of the subsoil are 15 to 35 percent gravel fragments. In unlimed areas, the surface layer is extremely acid to slightly acid.

Some areas are used for pasture. Many are forested.

This soil can occasionally be used for cultivated crops, but it is better suited to hay or pasture. Erosion is a serious hazard in cultivated areas. Cultivated crops should be grown infrequently and under maximum conservation measures. Stripcropping, diversion ditches, cross-slope tillage, cover crops, minimum tillage, and a high proportion of sod crops in the cropping system are needed to control erosion. Slope, gravel fragments, and seasonal wetness are additional problems for cultivation and equipment use.

This soil is suited to pasture, but reseeding and applying lime and fertilizer are somewhat difficult because of the moderately steep slopes. Erosion is a hazard if pastures are overgrazed. Proper stocking, rotation grazing, and restricted grazing when the soil is wet are needed to maintain pasture seedings.

Suitability for timber production is fair. Woodlots support such species as sugar maple, northern red oak, and black cherry. Logging trails should be laid out on the contour to avoid trail erosion and gullying. Slope is a limitation for equipment.

This soil is poorly suited to most urban uses because of slope, seasonal wetness, and slow or very slow permeability in the fragipan. Slope also restricts the use of this soil for recreation. Some areas are suitable for ski slopes.

The capability subclass is IVe.

MNE—Mardin soils, steep. These deep, moderately well drained, steep soils formed in glacial till deposits derived from sandstone, shale, and slate. They have a dense fragipan in the lower part of the subsoil. They are on hillsides, valley sides, and mountainsides of the uplands. The surface layer is gravelly silt loam or gravelly loam. Slope ranges from 25 to 35 percent. Areas are mostly long and narrow and 10 to 20 acres.

Typically the surface layer is dark brown gravelly silt loam 6 inches thick. The upper 5 inches of the subsoil is yellowish brown gravelly silt loam. The next 4 inches is a leached layer of mottled pale brown gravelly silt loam. Extending from 15 to 60 inches is a firm, olive brown channery silt loam fragipan.

Included with these soils in mapping are small areas of the somewhat poorly drained Erie soils on concave foot slopes. Also included are the well drained Bath soils on a few hillcrests. Some included areas are severely or very severely eroded, and in a few areas, large stones are on the surface. Very steep slopes are included in a few areas.

The water table is perched above the fragipan early in spring and in other excessively wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the pan and substratum. Available water capacity is moderate to low, and runoff is rapid to very rapid. Roots are restricted to the 14 to 25 inch zone above the dense pan, but a few penetrate along vertical cracks in the pan. Natural organic matter content is low. The surface layer and upper part of the subsoil are 15 to 35 percent gravel fragments. In unlimed areas, the surface layer is extremely acid to slightly acid.

Most areas of these soils are either idle or forested. A few are pastured.

These soils are not suited to cultivated crops and hay but can be used for pasture. Slopes are too steep for safe operation of equipment. Erosion is a very serious hazard if the plant cover is removed. Maintaining permanent vegetation on these soils is essential.

Pastures are generally of poor quality because of the extreme difficulty in reseeding and applying lime and fertilizer. Overgrazing can result in serious erosion. Limited grazing is needed to maintain a thick plant cover.

Suitability for timber production is fair to poor. Forested areas support such species as sugar maple and

northern red oak. Gullying is a serious problem along logging trails that are laid out on too steep a gradient. Equipment use is seriously limited by the steep slopes.

These soils are not suited to most urban and recreation uses because of steep slopes. Some areas can be improved for wildlife habitat by planting shrubs for food and cover.

The capability subclass is VIe.

My—Middlebury silt loam. This deep, moderately well drained to somewhat poorly drained, nearly level soil formed in recent silty alluvial deposits. It is on flood plains adjacent to streams that flood periodically. Slope is no more than 3 percent. Areas are mostly long and winding and 5 to 15 acres.

Typically the surface layer is very dark grayish brown silt loam 11 inches thick. The subsoil is 31 inches thick. The upper 6 inches is dark yellowish brown silt loam, and the lower 25 inches is mottled yellowish brown very fine sandy loam. The substratum from 42 to 60 inches is dark grayish brown, stratified sand and gravel.

Included with this soil in mapping are small areas of the poorly drained and very poorly drained Wayland soils on the lowest areas of the flood plain. Also included are a few higher spots of well drained Tioga soils. In some places the surface layer is gravelly or very gravelly.

In spring this Middlebury soil is commonly flooded. The seasonal high water table, which is partly controlled by the water level in the adjacent stream, rises into the subsoil early in spring. Permeability is moderate in the surface layer and subsoil and is rapid or very rapid in the substratum. Available water capacity is high, and runoff is slow. Root penetration is excellent after the water table recedes late in spring. Natural organic matter content is medium to high. The soil is generally gravel free but is as much as 15 percent gravel fragments in some areas. In unlimed areas, the surface layer is strongly acid to slightly acid.

Most areas are farmed. A few are idle or forested.

This nearly gravel free soil is easy to till. It is suited to cultivated crops, small grain, hay, and some vegetable crops (fig. 5). Seasonal wetness and flooding in spring delay planting of many crops. The soil is somewhat difficult to drain because of the water level in the adjacent stream. Suitable drainage outlets often have to be located considerable distances downstream. Flooding causes scour and erosion of the surface layer and deposits sediment and other debris. Cover crops, return of crop residue, and sod crops in the cropping system reduce scour and also promote tilth. Cultivation at the proper moisture content is needed to prevent compaction and destruction of desirable soil structure.

This soil is suitable for pasture. Grazing in wet periods and overgrazing are important management concerns. Restricted grazing in wet periods, rotation grazing, and proper stocking increase the longevity of pasture seedings.

Suitability for timber production is good. Woodlots commonly support such trees as northern red oak, sugar maple, and yellow-poplar. Windthrow, seedling mortality, and equipment limitation are generally not problems. Seasonal wetness or flooding can delay machine planting of seedlings in spring.

This soil is not suited to many urban uses because of the flood hazard and seasonal wetness. Some areas are suitable for recreation uses, such as picnic areas, athletic fields, and golf fairways. Recreation buildings should be anchored because of the flood hazard. This soil is generally a good source of topsoil.

Figure 5.—Nearly level Middlebury silt loam on flood plain along the Wallkill River. This soil can be cropped intensively.

The capability subclass is IIw.

NaD—Nassau shaly silt loam, 15 to 25 percent slopes. This shallow, somewhat excessively drained, moderately steep soil formed in glacial till deposits derived from slate and shale. It is on hillsides and valley sides in uplands. Areas are generally long and narrow and 5 to 15 acres.

Typically the surface layer is dark grayish brown shaly silt loam 8 inches thick. The subsoil is yellowish brown very shaly silt loam 10 inches thick. Hard, black shale bedrock is at a depth of 18 inches.

Included with this soil in mapping are small areas of the deep, well drained Bath soils. Areas of exposed bedrock occur in a few spots. Included in some large areas is a soil similar to Nassau soil that is 1 to 10 inches thick over bedrock. Included in other areas is a soil that is 20 to 40 inches thick over bedrock.

In this Nassau soil, there is no seasonal high water table above the bedrock. Permeability is moderate. Available water capacity is very low or low, and runoff is rapid. Depth to bedrock is 10 to 20 inches. Roots are restricted by bedrock. Natural organic matter content is low. Gravel and shale fragments make up 15 to 40 percent of the surface layer, and the content commonly increases in the subsoil. In unlimed areas, the surface layer is very strongly acid or strongly acid.

Most areas are either idle or forested. Some are pastured.

This soil is poorly suited to cultivated crops because of the steepness of slope, shallowness over bedrock, droughtiness in midsummer, and a few outcrops of rock. Hay can be grown, but the operation of harvesting equipment is difficult because of slope. Also, yields are generally low because of the lack of sufficient moisture to sustain growth in midsummer. A plant cover should be maintained year round because of the serious hazard of erosion.

This soil can be used for pasture, but growth is poor in midsummer because of droughtiness. Reseeding and applying lime and fertilizer are somewhat difficult because of slope and the few outcrops of rock. Rotation grazing, proper stocking, and restricted grazing in dry periods are needed to maintain pasture seedings.

Suitability for timber is poor. Woodlots support such species as sugar maple, northern red oak, and eastern white pine. Seedling mortality is a serious problem because of droughtiness. The use of equipment is limited. Windthrow is a hazard. Logging trails should be laid out across the slope to prevent erosion. Machine planting of seedlings is somewhat difficult because of slope.

This soil is poorly suited to most urban uses because of slope and shallowness over bedrock. It is suitable for a few recreation uses, including ski slopes, hiking trails, and horseback riding trails. Deep excavation is difficult because of the hard bedrock.

The capability subclass is VIe.

OkA—Oakville loamy fine sand, 0 to 3 percent slopes. This deep, well drained, nearly level soil formed in glacial outwash deposits that are dominantly fine sand. It is on terraces and flats in valleys and on lowland deltaic plains. Areas are mostly round and 5 to 15 acres.

Typically the surface layer is dark brown loamy fine sand 8 inches thick. The subsoil is very friable, yellowish brown fine sand 30 inches thick. The substratum to 48 inches is brown fine sand. To a depth of 60 inches it is loose, grayish brown fine and medium sand.

Included with this soil in mapping are small areas of the gravelly Hoosic soils and very gravelly Otisville soils. Pockets of the very poorly drained sandy Scarboro soils and gravelly Halsey soils in a few depressions are identified by spot symbols on the soil map. In a few areas the subsoil is fine sandy loam.

Depth to the seasonal high water table is more than 3 feet. Permeability is rapid in the surface layer and is very rapid in the subsoil and substratum. Available water capacity is low, and runoff is very slow. Root penetration is excellent if moisture is available. Natural organic matter content is low. The soil is generally gravel free. In unlimed areas, the surface layer is medium acid to neutral.

Areas are farmed or developed for urban uses. Some are idle.

This nearly level, gravel-free soil is generally easy to till and can be cultivated early in spring. It is only moderately suited to cultivated crops and hay because of droughtiness in summer and low natural fertility. Deep-rooted crops, such as alfalfa hay, are suited because they can obtain moisture from the subsoil and substratum. Specialized crops and vegetable crops do well if irrigated. Sprinkler irrigation is well suited to this soil and is generally easier to operate than on the gently sloping Oakville soils. Because the soil is low in natural fertility and fertilizers are easily leached away in the very rapidly permeable subsoil, timely application of fertilizer is needed. Minimum tillage, cover crops, return of crop residue and animal manure to the soil, and sod crops in the cropping system are needed to maintain tilth and improve the organic matter content, which increases the available water capacity.

This soil is suitable for early season pasture, but droughtiness restricts growth in midsummer. Proper stocking, rotation grazing, and restricted grazing in dry periods are needed to maintain pasture seedings.

Suitability for timber is poor to fair. Wooded areas commonly support such trees as northern red oak, red pine, and white pine. High seedling mortality is a serious problem because of droughtiness.

This soil is suitable for some urban uses. Very rapid permeability is a limitation for septic tank absorption fields. Careful design and construction of septic tank absorption fields are needed to prevent pollution of the water table. Lawns and golf fairways tend to grow slowly and sparsely unless irrigated and adequately fertilized. This nearly level soil provides good sites for athletic fields and picnic areas. Maintaining a full sod, however,

is difficult because of droughtiness. Some areas are suitable sources of sand.

The capability subclass is IVs.

OkB—Oakville loamy fine sand, 3 to 8 percent slopes. This deep, well drained, gently sloping soil formed in glacial outwash deposits that are dominantly fine sand. It is on terraces and undulating flats in valleys and on lowland deltaic plains. Areas are round or long and narrow and are commonly 10 to 20 acres.

Typically the surface layer is dark brown loamy fine sand 8 inches thick. The subsoil is very friable, yellowish brown fine sand 28 inches thick. The upper part of the substratum from 36 to 48 inches is brown fine sand, and the lower part to 60 inches is loose, grayish brown fine and medium sand.

Included with this soil in mapping are small areas of the gravelly Hoosic soils and very gravelly Otisville soils. Pockets of very poorly drained, sandy Scarboro soils and gravelly Halsey soils in a few depressions are identified by spot symbols on the soil map. In a few areas the subsoil is fine sandy loam.

Depth to the seasonal high water table is more than 3 feet. Permeability is rapid in the surface layer and is very rapid in the subsoil and substratum. Available water capacity is low, and runoff is slow. Root penetration is excellent if moisture is available. Natural organic matter content is low. The soil is generally gravel free. In unlimed areas, the surface layer is medium acid to neutral.

Some areas are farmed or developed for urban uses. Many are idle.

This gravel-free soil is generally easy to till and can be cultivated early in spring. It is not well suited to cultivated crops and hay because of droughtiness in summer and low natural fertility. Deep-rooted crops, such as alfalfa hay, are better suited to this soil than other crops because they obtain moisture from the subsoil and substratum. Specialized crops and vegetable crops do well if irrigated. Sprinkler irrigation is well suited to this soil but is somewhat more difficult to operate than on the nearly level Oakville soils. Because the soil is low in natural fertility and fertilizers are easily leached out in the very rapidly permeable subsoil, timely application of fertilizer is important. Erosion is a minor hazard in areas left bare of plant cover. Minimum tillage, cover crops, return of crop residue and animal manure to the soil, cross-slope tillage, and sod crops in the cropping system are needed to maintain tilth, to reduce the slight erosion hazard, and to improve organic matter content, which increases the available water capacity.

This soil is suitable for early season pasture, but droughtiness restricts growth in midsummer. Proper stocking, rotation grazing, and restricted grazing in dry periods are needed to maintain pasture seedings.

Suitability for timber is poor to fair. Wooded areas commonly support such species as northern red oak, red pine, and white pine. High seedling mortality is a serious problem because of droughtiness.

This soil is suitable for some urban uses. Careful design and construction of septic tank absorption fields is needed because the very rapidly permeable substratum allows movement of effluent into the water table. Lawns and golf fairways tend to grow slowly and sparsely unless irrigated and adequately fertilized. Some areas are suitable as a source of sand.

The capability subclass is IVs.

OtB—Otisville gravelly sandy loam, 0 to 8 percent slopes. This deep, excessively drained, nearly level to gently sloping soil formed in glacial outwash deposits that are dominantly sand and gravel. It is on terraces and undulating plains in valleys and on lowlands. Areas are mostly round or oval and 5 to 20 acres.

Typically the surface layer is dark grayish brown gravelly sandy loam 6 inches thick. The subsoil is 22 inches thick. The upper part is yellowish brown gravelly loamy sand, and the lower part is yellowish brown very gravelly sand. The substratum to a depth of 60 inches is grayish brown very gravelly sand.

Included with this soil in mapping are spots of the somewhat excessively drained to well drained Hoosic soils and Chenango soils and well drained sandy Oakville soils. Spots of the somewhat poorly drained to poorly drained Fredon soils occur in slightly lower areas. Pockets of the very poorly drained sandy Scarboro soils in a few depressions are identified by spot symbols on the soil map.

Depth to the water table is usually more than 6 feet. Permeability is rapid in the surface layer and subsoil and is rapid or very rapid in the substratum. Available water capacity is very low, and runoff is slow. Root penetration is good if moisture is available. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil and substratum. In unlimed areas, the surface layer is extremely acid to strongly acid.

Some areas are used for pasture, hay, and urban purposes. A few are used for cultivated crops, and some are mined for sand and gravel.

This soil is poorly suited to most crops because of severe summer droughtiness and low natural fertility. Deep-rooted crops, such as alfalfa hay, are somewhat better suited than shallow-rooted crops because they can obtain moisture from deep in the subsoil and substratum. Vegetable crops and field crops are suitable in areas where irrigation water is available. Gravel fragments, however, can interfere with precision planting and with harvesting. Gravel fragments also cause excessively rapid wear of tillage equipment. Timely application of fertilizer is important because of the overall low fertility of the soil and the hazard of fertilizer leaching through the rapidly permeable subsoil. Erosion is only a minor hazard in most areas. Minimum tillage, cover crops, return of crop residue, cross-slope tillage, and sod crops in the cropping system are needed to maintain tilth and to increase organic matter content, which improves available water capacity.

This soil can be used for early season pasture, but droughtiness restricts growth in midsummer. Proper stocking, rotation grazing, restricted grazing in dry periods, and lime and fertilizer are needed to maintain pasture seedings.

Suitability for timber is poor to fair. Wooded areas commonly support such species as sugar maple, northern red oak, and eastern white pine. Growth is usually slow and seedling mortality high because of droughtiness.

This soil is suitable for some urban and recreation uses. A thick sod cover for lawns and other uses is often difficult to establish and maintain because of droughtiness and gravel fragments. Because of the rapidly or very rapidly permeable substratum, careful design and installation of septic tank absorption fields are needed to overcome the hazard of pollution of the water table. Some areas are sources of sand and gravel.

The capability subclass is IVs.

OtC—Otisville gravelly sandy loam, 8 to 15 percent slopes. This deep, excessively drained, sloping soil formed in glacial outwash deposits that are dominantly sand and gravel. It is on terraces, ridges, and low rolling hills in valleys and on lowland plains. Areas are mostly round or oval and 5 to 20 acres.

Typically the surface layer is dark grayish brown gravelly sandy loam 6 inches thick. The subsoil is 20 inches thick. The upper part is yellowish brown gravelly loamy sand, and the lower part is yellowish brown very gravelly sand. The substratum to 60 inches is grayish brown very gravelly sand.

Included with this soil in mapping are spots of the somewhat excessively drained to well drained Hoosic soils and Chenango soils and well drained sandy Oakville soils. Pockets of the very poorly drained sandy Scarboro soils in a few depressions are identified by spot symbols on the soil map.

Depth to the water table is usually more than 6 feet. Permeability is rapid in the surface layer and subsoil and is rapid or very rapid in the substratum. Available water capacity is very low, and runoff is slow to medium. Root penetration is good if moisture is available. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer and the content increases in the subsoil and substratum. In unlimed areas the surface layer is extremely acid to strongly acid.

Some areas of this soil are used for pasture, hay, or urban purposes. Many are idle. A few are cultivated or are mined for sand and gravel.

This soil is poorly suited to most crops because of severe summer droughtiness and low natural fertility. Deep-rooted crops, such as alfalfa hay, are somewhat better suited than shallow-rooted crops because they can obtain moisture from the subsoil and substratum. Field crops can be grown more successfully in areas where irrigation water is available. This soil, however, is somewhat more difficult to irrigate than the less sloping Otisville soils because of slope and the increased erosion hazard. Gravel fragments interfere with planting and harvesting and cause excessively rapid wear of equipment. Timely application of fertilizer is important because of the low fertility of the soil and the hazard of fertilizer leaching through the rapidly permeable subsoil. Minimum tillage, cover crops, return of crop residue, cross-slope tillage where practical, and a high proportion of sod crops in the cropping system are needed to maintain tilth and reduce erosion and to increase organic matter content so that available water capacity is improved.

This soil can be used for early season pasture, but droughtiness restricts growth in midsummer. Proper stocking, rotation grazing, restricted grazing in dry periods, and lime and fertilizer are needed to maintain pasture seedings.

Suitability for timber is poor to fair. Wooded areas commonly support such trees as sugar maple, northern red oak, and eastern white pine. Growth is usually slow and seedling mortality high because of droughtiness.

This soil can be used for some urban and recreation purposes. Slope is a limitation for some uses. A thick sod cover for lawns and other uses is often difficult to establish and maintain because of droughtiness and gravel fragments. Careful design and installation of septic tank absorption fields is needed to overcome the hazard of water table pollution caused by the rapidly or very rapidly permeable substratum. Many areas are sources of sand and gravel.

The capability subclass is IVs.

OtD—Otisville gravelly sandy loam, 15 to 25 percent slopes. This deep, excessively drained, moderately steep soil formed in glacial outwash deposits that are dominantly sand and gravel. It is on the sides of ridges and low hills and along terrace fronts in valleys and on lowland plains. Areas are mostly long and narrow and 5 to 15 acres.

Typically the surface layer is dark grayish brown, gravelly sandy loam 5 inches thick. The subsoil is 18 inches thick. The upper part is yellowish brown gravelly loamy sand, and the lower part is yellowish brown very gravelly sand. The substratum from 23 to 60 inches is grayish brown very gravelly sand.

Included with this soil in mapping are spots of the somewhat excessively drained Hoosic soils, well drained to somewhat excessively drained Chenango soils, and well drained sandy Oakville soils. In a few areas the surface layer is severely eroded. Pockets of the very poorly drained sandy Scarboro soils in a few depressions are identified by spot symbols on the soil map.

Depth to the water table is usually more than 6 feet. Permeability is rapid in the surface layer and subsoil and rapid or very rapid in the substratum. Available water capacity is very low, and runoff is medium to rapid. Root penetration is good if moisture is available. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer, and the content

increases in the subsoil and substratum. In unlimed areas, the surface layer is extremely acid to strongly acid.

Some areas of this soil are used for pasture, but most are idle or wooded. A few are mined for sand and gravel.

This soil is not suitable for most cultivated crops because of severe summer droughtiness, slope, and low natural fertility. Deep-rooted plants for hay or pasture, such as alfalfa, are somewhat better suited than shallow-rooted plants because they can obtain moisture from deep in the subsoil and substratum. Erosion is a serious hazard in areas cleared of plant cover. Slope limits equipment use. Hay can be grown, but reseeding and harvesting are somewhat difficult.

This soil can be used for early season pasture, but droughtiness restricts growth in midsummer. Proper stocking, rotation grazing, and restricted grazing in dry periods are needed to maintain seedings. Reseeding and applying lime and fertilizer are somewhat difficult because of slope.

Suitability for timber is poor. Wooded areas commonly support such species as sugar maple, northern red oak, and eastern white pine. Growth is often slow and seedling mortality high because of droughtiness. Machine planting of seedlings is somewhat limited because of slope. Erosion is a hazard if logging trails are laid out on too steep a gradient.

This soil is poorly suited to most urban and recreation uses because of slope and droughtiness. Lawns and golf fairways are difficult to establish because of gravel fragments and droughtiness. Some areas are suitable for hiking trails or horseback riding trails. Many areas are sources of sand and gravel.

The capability subclass is VIs.

OVE—Otisville and Hoosic soils, steep. This map unit consists of the excessively drained Otisville soil and the somewhat excessively drained Hoosic soil. Some areas are entirely Otisville soils. Some are Hoosic soil. Other areas include both soils. These deep soils formed in glacial outwash deposits high in content of sand and gravel. They are along the front of terraces, on the sides of low hills, on ridges in valleys, and on lowland plains. The surface layer is gravelly sandy loam, gravelly loamy sand, gravelly loam, or very gravelly sandy loam. The slope ranges from 25 to 45 percent but is dominantly 25 to 35 percent. Areas are mostly long and narrow and 5 to 15 acres.

Typically the surface layer of the Otisville soil is dark grayish brown gravelly sandy loam 4 inches thick. The subsoil is 16 inches thick. The upper part is yellowish brown gravelly loamy sand, and the lower part is yellowish brown very gravelly sand. The substratum from 20 to 60 inches is loose, grayish brown very gravelly sand.

Typically the surface layer of the Hoosic soil is dark grayish brown gravelly sandy loam 4 inches thick. The yellowish brown subsoil is 18 inches thick. The upper part is gravelly sandy loam, the middle part is very gravelly sandy loam, and the lower part is very gravelly loamy sand. The substratum to a depth of 60 inches is loose, light olive brown very gravelly sand.

Included in mapping are small areas of the well drained to somewhat excessively drained gravelly Chenango soils and well drained sandy Oakville soils. A few included areas are severely or very severely eroded.

The water table in both soils is below 5 feet. Permeability in the Otisville soil is rapid in the subsoil and rapid or very rapid in the substratum. Permeability in the Hoosic soil is moderately rapid or rapid in the subsoil and is very rapid in the substratum. Available water capacity is very low in the Otisville soil and is low in the Hoosic soil. Runoff is rapid on both soils. Natural organic matter content is low in both soils. Root penetration is excellent in both soils if moisture is available. The surface layer is 15 to 35 percent gravel fragments in the Otisville soil and 15 to 50 percent in the Hoosic soil. In both soils, the content of gravel fragments increases in the subsoil and substratum. Unless limed, the surface layer is extremely acid to strongly acid in the Otisville soil and very strongly acid to strongly acid in the Hoosic soil.

Most areas of this unit are idle or forested.

The soils are not suited to cultivated crops or to hay. Slopes are too steep for the safe operation of equipment. Plant cover should be maintained continuously because of the very serious erosion hazard.

These soils are poorly suited to pasture because of slope and droughtiness. Some areas can be grazed, but the quality of pasture is usually very poor. Overgrazing when the soil is dry can thin the vegetative cover to the degree that erosion becomes a serious problem.

Suitability for timber is poor. Forested areas support such species as sugar maple and northern red oak. Steep slopes restrict the use of equipment. Seedlings must be hand planted, and the mortality rate is often high because of droughtiness.

This unit is not suited to most urban and recreation uses because of steep slopes. Many areas are suitable sources of sand and gravel.

The capability subclass is VIIs.

Pa—Palms muck. This deep, very poorly drained, level soil formed in organic deposits 16 to 50 inches thick over mineral soil deposits. It is in drained depressions and concave basins in lowland lake plains, outwash plains, and flood plains. The organic material is from well decomposed remnants of woody and herbaceous plants. Slope is no more than 2 percent and is mostly less than 1 percent. Areas are mostly wide and oval and 10 to 100 acres.

Typically the surface layer is black muck 12 inches thick. Very dark grayish brown muck extends to a depth of 25 inches. The mineral soil substratum to 60 inches is bluish gray heavy silt loam.

Included with this soil in mapping are spots of mineral soil deposits. These are very poorly drained Alden soils. A few small areas where the organic deposits are more

than 51 inches thick are Carlisle soils. Many spots of very poorly drained Wallkill soils and poorly drained and very poorly drained Wayland soils are included along streams.

Although this soil is drained, it is still subject to occasional ponding or flooding early in spring. The water table is near the surface in spring but is lowered quickly through the drainage network once upland runoff subsides. Permeability is moderately slow to moderately rapid in the organic layers and moderate or moderately slow in the mineral substratum. Available water capacity is very high, and runoff is very slow. Depth of the root zone is limited to the depth of the water table maintained by the drainage system. Natural organic matter content is very high. There are a few woody fragments in the surface layer in some areas. Reaction in the surface layer is strongly acid to mildly alkaline.

Most areas of this soil are intensively used for vegetable crops. Only a few areas are idle.

If drained, this soil is well suited to vegetable crops such as onions, celery, and lettuce. It is also suited to sod crops for lawns. Crops, such as corn, needed on dairy farms can be grown, but economic returns are generally less than for vegetable crops or specialized crops. The principal management concerns are maintaining the drainage system and controlling wind erosion. Open ditches should be cleaned periodically because of siltation from flooding, wind deposition, and side bank sloughing. Wind erosion is a hazard unless controlled by planted or manmade windbreaks. Practices that slow subsidence and oxidation of the organic deposits prolong the crop-productive life of the soil. Controlled drainage systems that regulate the water table, cover crops, tillage at the proper moisture content, and minimum tillage reduce compaction and oxidation, promote tilth, and reduce the risk of wind erosion. This soil has a shorter productive life than the similar Carlisle soils, which have thicker organic deposits.

This muck is poorly suited to pasture. Livestock puncture the surface, compacting the soil and destroying pasture seedings.

Suitability for timber production is poor. Wet-tolerant species such as red maple, willow, and alder occur in a few areas. Equipment limitation, seedling mortality, and windthrow hazard are very serious problems.

Seasonal flooding or ponding, low strength, high frost action hazard, and poor trafficability are serious limitations for urban and recreation uses. Although the soil is drained, wetness is a problem in deep excavations. Areas where the muck deposits become too thin for economical crop production have some potential for the development of wetland wildlife marshes.

The capability subclass is IIIw.

Pb—Palms muck, ponded. This deep, very poorly drained, level soil formed in organic deposits 16 to 50 inches thick over mineral soil deposits. It is in depressions and bogs in uplands and in concave basins in lowland plains. The organic material is from well decomposed remnants of woody and herbaceous plants. The slope is no more than 2 percent and is mainly less than 1 percent. Areas are mostly small and round and 5 to 15 acres.

Typically the surface layer is black muck 13 inches thick. Very dark grayish brown muck extends to a depth of 26 inches. The underlying mineral soil substratum to 60 inches is bluish gray heavy silt loam.

Included with this soil in mapping are spots of mineral soil deposits. These are very poorly drained Alden soils. A few small areas where the organic deposits are more than 51 inches thick are Carlisle soils.

This soil is subject to ponding in spring. The water table is at or near the surface most of the year. Permeability is moderately slow to moderately rapid in the organic layers and is moderate or moderately slow in the mineral substratum. Available water capacity is very high, and runoff is very slow. Roots are limited mainly to the surface layer because of the prolonged high water table. Natural organic matter content is very high. There are a few woody fragments in the surface layer in some areas. Reaction in the surface layer is strongly acid to mildly alkaline.

Most areas of this soil are idle and support only the grasses, shrubs, and trees that tolerate wetness.

This soil is not suited to crop production unless it is drained. If adequately drained, it is exceptionally productive of vegetable crops and specialized crops. Drainage outlets are generally extremely difficult to establish because of the very low position in the landscape. A pumping system may be needed because of the poor outlets. Drainage may not be feasible where the organic deposits are less than 30 inches thick. In these areas the muck will have a relatively short productive life because of subsidence and oxidation. In many places the drainage potential is poor because areas are small and inaccessible. Where drainage is practical, windbreaks planted as field borders reduce the wind erosion hazard in cultivated areas.

This soil is poorly suited to pasture because of prolonged wetness. Livestock puncture the surface compacting the soil and trampling desirable grasses. Reseeding and applying fertilizer are very difficult because of poor trafficability.

Suitability for timber production is poor. Wet-tolerant species such as red maple and quaking aspen are growing in a few areas. Prolonged wetness is a serious equipment limitation and causes high seedling mortality and severe windthrow.

This soil is not suited to most urban and recreation uses because of prolonged wetness, the hazard of ponding, low strength, high frost action potential, and poor trafficability. Some areas are well suited to the development of wetland wildlife marshes.

The capability subclass is Vw.

Pg—Pits, gravel. Pits are excavations mainly in gravelly and sandy glacial outwash deposits. The pits were

created by removing gravel and sand for construction. They are 3 to 50 feet deep. The sides are generally steep, and the floor is relatively level. Piles of stones and boulders are commonly scattered in areas of the pit floor. Small pools of water are in some of the pits, particularly in spring. The excavations are mostly irregular in shape, depending on the nature of the deposits and on ownership boundaries. Areas are dominantly 3 to 10 acres, but a few are 50 acres or more.

These pits are generally devoid of vegetation, but some older ones have a few bushes, grasses, and annual plants. The pits are droughty because of the very low available water capacity. Permeability varies, but is generally moderately rapid to very rapid.

These areas are mostly idle. Abandoned pits are generally not suited to farming because of droughtiness, high content of gravel and stones, and irregular topography. Onsite investigation of each area is required to determine the feasibility of reclamation for crop production.

Gravel pits are highly variable in their potential suitability for urban and recreation uses. Possible pollution of the ground water is a limitation for sanitary waste disposal. Lawns, grasses, and other plant cover are often difficult to establish because of gravel and stones, lack of moisture, and low natural fertility. Most areas are poorly suited to timber production unless extensively reclaimed. The improvement of wildlife habitat is possible in some areas. Some songbirds nest along pit walls.

No capability subclass is assigned.

PtB—Pittsfield gravelly loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil formed in glacial till deposits derived from limestone and schist. It is on hilltops, ridges, and knolls in uplands. Areas are mostly round and 5 to 15 acres.

Typically the surface layer is very dark brown gravelly loam 10 inches thick. The subsoil is 24 inches thick. The upper part is yellowish brown gravelly loam, the middle part is yellowish brown gravelly fine sandy loam, and the lower part is dark yellowish brown gravelly fine sandy loam. The substratum to a depth of 60 inches is very friable, brown gravelly sandy loam.

Included with this soil in mapping are small areas where the surface is covered with large stones. A few small depressions that include very poorly drained Alden soils are identified by spot symbols on the soil map. In the towns of Montgomery and Crawford is an included soil that is similar to Pittsfield soil but has a high content of shale fragments and is strongly acid in the substratum. A few small areas include moderately well drained Mardin soils and well drained Bath soils, which have a fragipan.

Depth to the water table is usually more than 6 feet. Permeability is moderately rapid in the surface layer and subsoil and moderate to moderately rapid in the substratum. Available water capacity is moderate to high, and runoff is slow to medium. Roots are not restricted, and some extend into the substratum. Natural organic matter content is low. Gravel fragments make up 15 to 20 percent of the surface layer, and the content commonly increases in the subsoil and substratum. In unlimed areas, the surface layer is very strongly acid to neutral.

Most areas are farmed. Some are used for urban development, and a few are idle.

This soil is well suited to cultivated crops, small grain, and hay. Erosion is a hazard, particularly on long slopes and in intensively cultivated areas. Gravel fragments are slightly bothersome for some kinds of planting and harvesting and cause excessively rapid wear of equipment. Random tile drains to the included wet spots improve some fields. Cross-slope tillage, return of crop residue, cover crops, minimum tillage, and a few sod crops in the cropping system are needed to maintain tilth, improve organic matter content, and reduce erosion. This soil can be intensively cultivated under maximum conservation measures.

This soil is well suited to pasture grasses. Proper stocking, rotation grazing, and restricted grazing in wet periods extend the life of pasture seedings.

Suitability for timber production is good. Woodlots commonly support such species as northern red oak, sugar maple, and white pine. There are few limitations in the use of equipment and little hazard of windthrow, seedling mortality, or erosion.

This soil is suited to urban and recreation uses. Many areas provide excellent sites for houses and other buildings. Small stones are slightly bothersome in landscaping and seeding lawns and golf fairways.

The capability subclass is IIe.

PtC—Pittsfield gravelly loam, 8 to 15 percent slopes. This deep, well drained, sloping soil formed in glacial till deposits derived from limestone and schist. It is on hillcrests, ridges, and knolls in uplands. Areas are mostly oblong and 5 to 15 acres.

Typically the surface layer is very dark brown gravelly loam 9 inches thick. The subsoil is 22 inches thick. The upper part is yellowish brown gravelly loam, the middle part is yellowish brown gravelly fine sandy loam, and the lower part is dark yellowish brown gravelly fine sandy loam. The substratum to a depth of 60 inches is very friable, brown gravelly sandy loam.

Included with this soil in mapping are small areas where the surface is covered with large stones and a few areas of the moderately well drained Mardin soils and well drained Bath soils that have a fragipan. A few small areas are severely eroded, and in some areas there is a compact, dense substratum. In the towns of Montgomery and Crawford is an included soil that is similar to Pittsfield soil but has a high content of shale fragments and is strongly acid in the substratum.

Depth to the water table is usually more than 6 feet. Permeability is moderately rapid in the surface layer and subsoil and moderate to moderately rapid in the substratum. Available water capacity is moderate to high, and

runoff is medium. Roots are not restricted, and some extend into the substratum. Natural organic matter content is low. Gravel fragments make up 15 to 20 percent of the surface layer, and the content commonly increases in the subsoil and substratum. In unlimed areas, the surface layer is very strongly acid to neutral.

Most areas of this soil are farmed. A few are used for urban development or are idle.

This soil is suited to cultivated crops, small grain, and hay. Erosion is a serious hazard, particularly on long slopes. Gravel fragments are slightly bothersome for some kinds of planting and harvesting and cause excessively rapid wear of equipment. Random tile drains to included wet spots are needed to make some fields more uniform. Cross-slope tillage, stripcropping, return of crop residue, cover crops, minimum tillage, and sod crops in the cropping system are needed to control erosion and maintain tilth.

This soil is well suited to pasture grasses. Proper stocking, rotation grazing, and restricted grazing when the soil is wet extend the life of pasture seedings.

Suitability for timber production is good. Woodlots commonly support such species as northern red oak, sugar maple, and white pine. There are few limitations for the use of equipment and little hazard of windthrow, seedling mortality, or erosion. Logging trails should be laid out across the slope to prevent trailside gullying.

This soil can be used for some urban and recreation uses. Slope and small stones are limitations. Some areas provide good homesites, but careful site selection is needed.

The capability subclass is IIIe.

PtD—Pittsfield gravelly loam, 15 to 25 percent slopes. This deep, well drained, moderately steep soil formed in glacial till deposits derived from limestone and schist. It is on hillsides, valley sides, and ridges in uplands. Areas are long and narrow and commonly 5 to 20 acres.

Typically the surface layer is very dark brown gravelly loam 8 inches thick. The subsoil is 20 inches thick. The upper part is yellowish brown gravelly loam, the middle part is yellowish brown gravelly fine sandy loam, and the lower part is dark yellowish brown gravelly fine sandy loam. The substratum to a depth of 60 inches is very friable, brown gravelly sandy loam.

Included with this soil in mapping are small areas where the surface is covered with large stones and a few areas of moderately well drained Mardin soils and well drained Bath soils that have a fragipan. A few small areas are severely eroded, and in some areas there is a dense substratum. In the towns of Montgomery and Crawford is an included soil that is similar to Pittsfield soil but has a high content of shale fragments and is strongly acid in the substratum.

Depth to the water table is usually more than 6 feet. Permeability is moderately rapid in the surface layer and subsoil and moderate to moderately rapid in the substratum. Available water capacity is moderate to high, and runoff is medium to rapid. Roots are not restricted, and some extend into the substratum. Natural organic matter content is low. Gravel fragments make up 15 to 20 percent of the surface layer, and the content commonly increases in the subsoil and substratum. In unlimed areas, the surface layer is very strongly acid to neutral.

Many areas of this soil are either pastured or idle. Only a few are cultivated.

This soil is not well suited to cultivated crops because of steepness of slope. It is generally better suited to hay or pasture. Erosion is a very serious hazard, particularly on long slopes or in areas bare of plant cover. Operating equipment is somewhat difficult because of the moderately steep slopes. Cultivation should be infrequent and under maximum conservation measures. Cross-slope tillage, stripcropping, cover crops, return of crop residue, and a high proportion of sod crops in the cropping system minimize the erosion hazard and maintain soil tilth.

This soil is suitable for pasture. Proper stocking, rotation grazing, and restricted grazing when the soil is wet are needed to maintain pasture seedings. Reseeding and fertilizing are somewhat difficult because of the slope.

Suitability for timber production is fair to good. Woodlots commonly support such species as northern red oak, sugar maple, and white pine. Equipment use is somewhat limited because of slope. Logging trails laid out across the slope reduce the hazard of erosion and gullying.

This soil is poorly suited to most urban and recreation uses because of slope. Some areas are suitable for hiking trails. In many areas wildlife habitat can be improved by planting shrubs for food and cover.

The capability subclass is IVe.

Qu—Quarries. Quarries are excavations into various kinds of bedrock, including shale, slate, limestone, and granitic gneiss. The rock material has been removed for road subgrade and other construction purposes. Areas are 5 to 80 feet deep. They have nearly vertical sides and relatively level floors. Piles of rock are commonly scattered across parts of the quarry floor. There are small pools of water in some quarries. Areas vary in shape, depending on ownership boundaries and the nature of the bedrock strata. They are mainly 3 to 5 acres, but at least two large quarries are more than 20 acres.

Areas no longer quarried are mostly idle. Scraggly bushes and brambles are anchored in a few crevices in side walls and along quarry floors.

Abandoned quarries are generally unsuitable for farm, urban, and recreation uses. Reclamation of areas is very difficult because not enough soil material is available for landscaping and revegetation. Pollution of the water table is a hazard if waste materials are dumped on abandoned quarry floors. Some areas provide excellent sites for viewing geologic strata.

No capability subclass is assigned.

Ra—Raynham silt loam. This deep, somewhat poorly drained to poorly drained, nearly level soil formed in glacial lake-laid deposits of coarse silt and very fine sand. It is in slight depressional areas in uplands and on low benches in valleys. Areas are mostly round and 5 to 10 acres.

Typically the surface layer is dark grayish brown silt loam 8 inches thick. The subsoil is 18 inches thick. The upper 6 inches is mottled light brownish gray silt loam, and the lower 12 inches is mottled dark yellowish brown silt loam. The substratum from 26 to 60 inches is firm, brown silt loam.

Included with this soil in mapping are slightly higher spots of the moderately well drained Scio soils and a few slightly lower areas of the poorly drained and very poorly drained Canandaigua soils. In a few areas, the subsoil is fine textured and in other small areas the surface layer is gravelly.

The water table rises into the upper part of the subsoil in spring. Permeability is moderate in the surface layer, moderate or moderately slow in the subsoil, and slow in the substratum. Available water capacity is high, and runoff is slow. Roots are mostly confined to the upper part of the subsoil until the water table recedes late in spring. Natural organic matter content is medium. The soil is generally gravel free. The surface layer is strongly acid to neutral.

Some areas of this soil are in hay or pasture. Many are either idle or wooded.

This soil can be used for cultivated crops, but seasonal wetness is a serious limitation. Drainage is needed for optimum crop production. A combination of subsurface tile drains and open ditch drains is often required. In some areas drainage outlets are difficult to locate. If adequately drained, this gravel- and stone-free soil is easy to till. Minimum tillage, return of crop residue, cover crops, sod crops in the cropping system, and tillage at the proper moisture content are needed to maintain tilth and increase organic matter content. Some adequately drained areas are suitable for vegetable crops as well as for field crops. Undrained or partly drained areas can be used for hay crops, but wet-tolerant seedings are needed.

Seasonal wetness limits the use of this soil for pasture. Grazing in spring compacts the soil and destroys desirable pasture grasses. Rotation grazing, proper stocking, and restricted grazing when the soil is wet extend the life of pasture seedings.

Suitability for timber production is poor to fair. Wooded areas support such species as red maple and white spruce. Equipment limitation and the hazards of seedling mortality and windthrow are serious because of seasonal wetness. Machine planting of seedlings is generally not feasible.

This soil is poorly suited to most urban and recreation uses because of seasonal wetness, slow permeability in the substratum, and high frost action potential. This soil tends to slough or slump in cuts or excavations. Some areas are suitable for the development of wildlife marshes.

The capability subclass is IIIw.

RbA—Rhinebeck silt loam, 0 to 3 percent slopes. This deep, somewhat poorly drained, nearly level soil formed in glacial lake-laid deposits that are high in content of silt and clay. It is on flats and in basins in lowland plains. Areas are mostly round and 5 to 10 acres.

Typically the surface layer is very dark grayish brown silt loam 7 inches thick. The subsoil is 38 inches thick. The upper part is mottled yellowish brown silt loam, the middle part is mottled dark grayish brown heavy silty clay loam, and the lower part is dark grayish brown, yellowish brown, and gray silty clay loam. The substratum to a depth of 60 inches is dark grayish brown silty clay loam.

Included with this soil in mapping are small areas of the very poorly drained and poorly drained Madalin soils in depressions and moderately well drained Collamer soils on slightly higher ridges and knolls.

The water table is at a depth of 6 to 18 inches in spring and other wet periods. It is perched above slowly permeable layers in the middle and lower parts of the subsoil. Available water capacity is moderate to high, and runoff is slow. Roots are restricted to the upper part of the subsoil by the seasonal high water table. As the water table recedes late in spring, roots extend into the lower part of the subsoil. Natural organic matter content is moderate. The soil is generally gravel free. The surface layer is strongly acid to neutral.

Some areas of this soil are used for hay or pasture. Many are idle or forested.

This soil is poorly suited to cultivated crops unless drained. It can be highly productive of many crops if adequately drained. Drainage is somewhat difficult because of the slowly permeable clayey subsoil and substratum. Drains generally must be closely spaced to be effective. Bedding improves surface drainage. Minimum tillage, cover crops, return of crop residue, and tillage at the proper moisture content are needed to maintain tilth and increase organic matter content.

This soil is moderately suited to hay and pasture. Pasture can be used for summer grazing. Grazing early in spring compacts the soil and destroys desirable grasses. Plants that withstand seasonal wetness are needed for productive hay seedings. Rotation grazing and proper stocking are needed.

Suitability for timber production is fair to good. Wooded areas support such species as northern red oak and sugar maple. Seasonal wetness limits the use of some equipment. Machine planting of seedlings is often not feasible early in spring.

This soil is poorly suited to many urban uses because of seasonal wetness, slow permeability, and the high content of clay in the subsoil. Careful installation of drains around foundations is important. Some areas can

be used for recreation purposes, such as campsites, picnic areas, and hiking trails. Wetness prevents early season use. Other areas provide sites for ponds.

The capability subclass is IIIw.

RbB—Rhinebeck silt loam, 3 to 8 percent slopes. This deep, somewhat poorly drained, gently sloping soil formed in glacial lake-laid deposits that are high in content of silt and clay. It is on undulating flats and foot slopes of ridges on lowland plains. Areas are mostly oval and 5 to 15 acres.

Typically the surface layer is very dark grayish brown silt loam 7 inches thick. The subsoil is 34 inches thick. The upper part is mottled yellowish brown silt loam, the middle part is mottled dark grayish brown heavy silty clay loam, and the lower part is dark grayish brown, yellowish brown, and gray silty clay loam. The substratum to a depth of 60 inches is dark grayish brown silty clay loam.

Included with this soil in mapping are small areas of the very poorly drained and poorly drained Madalin soils in depressions and moderately well drained Collamer soils on slightly higher ridges and knolls. Also included are a few severely eroded spots.

The water table is at a depth of 6 to 18 inches in spring and other wet periods. It is perched above slowly permeable layers in the middle and lower parts of the subsoil. Available water capacity is moderate to high, and runoff is slow to medium. Roots are restricted to the upper part of the subsoil by the seasonal high water table, but as the water table recedes late in spring, roots can extend into the lower part of the subsoil. Natural organic matter content is moderate. The soil is generally gravel free. The surface layer is strongly acid to neutral.

Some areas are used for hay or pasture, but many are idle or forested.

Unless drained, this soil is poorly suited to cultivated crops. If adequately drained, it can be highly productive of many crops. Drainage is somewhat difficult to establish because of the slowly permeable clayey subsoil and substratum. Drains generally must be closely spaced. Interceptor drains collect and divert surface runoff and subsurface seepage from higher adjacent soils. Erosion is a hazard in cultivated areas. Minimum tillage, cover crops, cross-slope tillage, return of crop residue, and tillage at the proper soil moisture content are needed to maintain tilth, increase organic matter content, and control erosion.

This soil is moderately suited to hay and pasture. Pasture can be used for summer grazing. Grazing early in spring, however, when the soil is wet compacts the soil and destroys desirable grasses. Rotation grazing, proper stocking, and plants that withstand seasonal wetness are needed to maintain productive pastures.

Suitability for timber production is fair to good. Wooded areas support such species as northern red oak and sugar maple. Seasonal wetness limits the use of some equipment. Logging trails across the slope prevent trailside erosion and gullying.

This soil is poorly suited to many urban uses because of seasonal wetness, slow permeability, and the high content of clay in the subsoil. Careful installation of drains around foundations is important. Some areas can be used for recreation purposes, such as campsites, picnic areas, and hiking trails. Wetness prevents early season use. Other areas provide suitable sites for dike ponds. This soil, however, is erodible, is somewhat difficult to compact evenly, and has low strength.

The capability subclass is IIIw.

RhA—Riverhead sandy loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil formed in glacial outwash deposits that are dominantly sand and gravel. It is on valley terraces and nearly flat plains. Areas are mostly round or oval and 5 to 10 acres.

Typically the surface layer is brown sandy loam 10 inches thick. The subsoil is 25 inches thick. The upper part is yellowish brown fine sandy loam, the middle part is olive brown fine sandy loam, and the lower part is yellowish brown loamy sand. The substratum to a depth of 60 inches is loose, olive brown stratified sand and gravel.

Included with this soil in mapping are small areas where the depth to the stratified sand and gravel substratum is more than 40 inches. A few small depressions of the very poorly drained Scarboro soils are identified by spot symbols on the soil map. In a few areas the surface layer is gravelly or very gravelly. A few small, slightly lower benches of the moderately well drained Castile soils are also included.

Depth to the water table in this Riverhead soil is usually more than 6 feet. Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is moderate, and runoff is very slow. Roots are not restricted, and some extend well into the substratum. Natural organic matter content is low. Gravel fragments make up 0 to 5 percent of the surface layer, and the content commonly increases to more than 30 percent in the substratum. In unlimed areas, the surface layer is strongly acid or very strongly acid.

Most areas are used for farming or urban development. A few are idle.

This soil is easy to till. If well managed, it can be cropped intensively. It is well suited to cultivated crops, small grain, and hay. In some areas it is exceptionally well suited to vegetable crops and early market crops. It warms up rapidly in spring and can be cultivated early in the growing season. Droughtiness is sometimes a slight problem in midsummer. The surface layer commonly contains gravel fragments, but the content is not high enough to interfere with precision planting. Sprinkler irrigation is well suited. Irrigation is somewhat easier to manage on this nearly level soil than on the more sloping Riverhead soils. Minimum tillage, cover crops, return of crop residue, and sod crops in the cropping system are needed to maintain tilth and increase the organic matter content, which improves available water capacity.

This soil is well suited to pasture grasses. Proper stocking, lime and fertilizer, and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is good. Woodlots support such species as sugar maple, northern red oak, and eastern white pine. There are few equipment limitations and little hazard of windthrow, seedling mortality, or erosion.

This soil is well suited to most urban and recreation uses. Many areas provide excellent homesites. Pollution of the underlying water table by effluent from septic tank absorption fields is a hazard because of the very rapidly permeable substratum. Some areas are exceptionally well suited to athletic fields and other uses that require a nearly level, well drained site. Areas of this soil are also excellent aquifers.

The capability subclass is IIs.

RhB—Riverhead sandy loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil formed in glacial outwash deposits that are dominantly sand and gravel. It is on valley terraces and undulating plains. Areas are mostly oval and 5 to 15 acres.

Typically the surface layer is brown sandy loam 9 inches thick. The subsoil is 21 inches thick. The upper part is yellowish brown fine sandy loam, the middle part is olive brown fine sandy loam, and the lower part is yellowish brown loamy sand. The substratum to a depth of 60 inches is loose, olive brown stratified sand and gravel.

Included with this soil in mapping are small areas where depth to the stratified sand and gravel substratum is more than 40 inches. A few small depressions that include the very poorly drained Scarboro soils are identified by spot symbols on the soil map. In a few areas the surface layer is gravelly or very gravelly. Also included in a few small slightly lower areas are the moderately well drained Castile soils. In some small areas there is a thin mantle of silty deposits.

Depth to the water table in this Riverhead soil is usually more than 6 feet. Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is moderate, and runoff is slow to medium. Roots are not restricted, and some extend well into the substratum. Natural organic matter content is low. Gravel fragments make up 0 to 5 percent of the surface layer, and the content commonly increases to more than 30 percent in the substratum. In unlimed areas, the surface layer is strongly acid or very strongly acid.

Most areas are used for farming or urban development. A few areas are idle.

This soil is well suited to cultivated crops, small grain, and hay. In some areas it is suited to vegetable crops and early market crops. It warms up rapidly in spring and can be cultivated early in the growing season. Droughtiness is a slight problem in midsummer. Erosion is a minor hazard on long slopes. There are gravel fragments in the soil, but the content is generally not high enough to interfere with precision planting. This soil is suitable for sprinkler irrigation but is somewhat more difficult to irrigate than the nearly level Riverhead soils. Random subsurface drains to a few included wet spots improve some fields. Minimum tillage, cover crops, cross-slope tillage, return of crop residue, and sod crops in the cropping system are needed to maintain tilth, increase the organic matter content, improve available water capacity, and control erosion. Timely application of fertilizer is needed.

This soil is well suited to pasture grasses. Proper stocking, lime and fertilizer, and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is good. Woodlots support such species as sugar maple, northern red oak, and eastern white pine. There are few equipment limitations and little hazard of windthrow, seedling mortality, or erosion.

This soil is well suited to most urban and recreation uses. Many areas provide excellent homesites. Pollution of the underlying water table by effluent from septic tank absorption fields is a hazard because of the very rapidly permeable substratum. Areas of this soil are excellent aquifers. Some areas are good sources of sand and gravel.

The capability subclass is IIs.

RhC—Riverhead sandy loam, 8 to 15 percent slopes. This deep, well drained, sloping soil formed in glacial outwash deposits that are dominantly sand and gravel. It is on terrace fronts, low rolling hills, and ridges in valleys and on plains. Areas are long and narrow or oval and commonly 5 to 10 acres.

Typically the surface layer is brown sandy loam 8 inches thick. The subsoil is 19 inches thick. The upper part is yellowish brown fine sandy loam, the middle part is olive brown fine sandy loam, and the lower part is yellowish brown loamy sand. The substratum to a depth of 60 inches is loose, olive brown stratified sand and gravel.

Included with this soil in mapping are small areas where depth to the stratified sand and gravel substratum is more than 40 inches. In a few areas the surface layer is gravelly or very gravelly. Included on foot slopes are a few small areas of moderately well drained Castile soils.

Depth to the water table in this Riverhead soil is usually more than 6 feet. Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is moderate, and runoff is medium. Roots are not restricted, and some extend well into the substratum. Natural organic matter content is low. Gravel fragments make up no more than 5 percent of the surface layer, but the content commonly increases to more than 30 percent in the substratum. In unlimed areas, the surface layer is strongly acid or very strongly acid.

Many areas are farmed. Some are idle or forested.

This soil is suited to cultivated crops, small grain, and hay. In cultivated areas erosion is a hazard on long slopes and in areas left bare of a plant cover. The soil warms rapidly in spring and can be cultivated early in the growing season. Droughtiness is a problem in midsummer in some years. There are gravel fragments in the surface layer, but the content is generally not high enough to interfere with precision planting. This soil can be irrigated, but careful application of water is required to prevent erosion. Minimum tillage, cover crops, return of crop residue to the soil, cross-slope tillage, strip-cropping where practical, and a high proportion of sod crops in the cropping system are needed to control erosion, maintain tilth, and increase organic matter content, which improves available water capacity.

This soil is suited to pasture. Proper stocking, lime and fertilizer, and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is good. Woodlots support such species as sugar maple, northern red oak, and eastern white pine. There are few equipment limitations and little hazard of windthrow or seedling mortality. Logging trails on the contour reduce the risk of erosion along the trails.

This soil is suited to some urban and recreation uses. Some areas can be used for houses, but careful site selection is needed. Pollution of the water table by effluent from septic tank absorption fields is a hazard because of the very rapidly permeable substratum. Slope is a limitation for some uses. Areas of this soil are excellent aquifers. Many areas are good sources of sand and gravel.

The capability subclass is IIIe.

RhD—Riverhead sandy loam, 15 to 25 percent slopes. This deep, well drained, moderately steep soil formed in glacial outwash deposits that are dominantly sand and gravel. It is on terrace fronts, low rolling hills, and ridge sides in valleys and on plains. Areas are long and narrow or oval and commonly 5 to 10 acres.

Typically the surface layer is brown sandy loam 7 inches thick. The subsoil is 19 inches thick. The upper part is yellowish brown fine sandy loam, the middle part is olive brown fine sandy loam, and the lower part is yellowish brown loamy sand. The substratum to a depth of 60 inches is loose, olive brown stratified sand and gravel.

Included with this soil in mapping are small areas where depth to the stratified sand and gravel substratum is more than 40 inches and a few areas where the surface layer is gravelly or very gravelly. Also included are a few areas of moderately well drained Castile soils on foot slopes and some areas that are severely eroded.

Depth to the water table in this Riverhead soil is usually more than 6 feet. Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is moderate, and runoff is rapid. Roots are not restricted, and some extend well into the substratum. Natural organic matter content is low. Gravel fragments make up no more than 5 percent of the surface layer, but the content commonly increases to more than 30 percent in the substratum. In unlimed areas, the surface layer is strongly acid or very strongly acid.

Some areas are used for pasture or hay crops. Many areas are idle, and a few are forested.

This soil is better suited to pasture or hay than to cultivated crops. Erosion is a very serious hazard in cultivated areas or in areas where the plant cover has been removed. Operating equipment is somewhat difficult and hazardous because of the moderately steep slopes. Cultivated crops should be grown infrequently and under maximum conservation measures. Droughtiness in midsummer can reduce yields of second and third cuttings of hay.

Pasture grasses can be grown on this soil. Proper stocking, lime and fertilizer, and rotation grazing are needed to maintain pasture seedings. Pasture can be grazed early in spring but by midsummer growth is slow because of droughtiness.

Suitability for timber production is fair to good. Woodlots commonly support such species as sugar maple, northern red oak, and eastern white pine. Moderately steep slopes limit the use of harvesting and planting equipment. Logging trails laid out across the slope reduce the risk of gullying along trails.

This soil is poorly suited to many urban and recreation uses because of slope. Pollution of the water table by effluent from septic tank absorption fields is a hazard because of the very rapidly permeable substratum. Some included less sloping areas provide homesites, but careful site selection is needed. Many areas are good sources of sand and gravel.

The capability subclass is IVe.

RKC—Rock outcrop-Arnot complex, sloping. This complex of exposed bedrock and the shallow, somewhat excessively drained to moderately well drained Arnot soil is on hillcrests and ridges of the mountainous uplands. The Arnot soil formed in a thin mantle of glacial till deposits over sandstone or shale bedrock. This gently sloping to sloping complex commonly has a "stairstep" appearance because of the ledgy, horizontal bedrock. The areas of Arnot soil are intermingled with Rock outcrop but are mainly on the lower slopes and on benches. The slope ranges from 3 to 15 percent but is dominantly 8 to 15 percent.

This complex is about 50 percent Rock outcrop, 35 percent Arnot channery silt loam or channery loam, and 15 percent other soils. Areas of Rock outcrop and the Arnot soil occur in such an intricate pattern that they were not mapped separately. Rock outcrop protrudes as exposed ledges and angular blocks of sandstone or shale.

Typically the Arnot soil has a surface layer of dark brown channery silt loam 4 inches thick. The subsoil is

reddish brown very channery silt loam 11 inches thick. Brown and gray sandstone is at a depth of 15 inches.

Included with this complex in mapping are large areas of a very shallow soil that is similar to the Arnot soil but has bedrock within a depth of 10 inches. Also included are small areas of well drained Lordstown soils that have bedrock at 20 to 40 inches, well drained to moderately well drained Swartswood soils, moderately well drained to somewhat poorly drained Wurtsboro soils, and very poorly drained Alden soils in a few small areas where bedrock is below 60 inches.

Where the bedrock under the Arnot soil is poorly fractured and jointed, the water table is perched above the rock for brief periods in spring. Permeability in the Arnot soil is moderate. Available water capacity is low or very low. Runoff is medium to rapid. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Channery fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. In unlimed areas, the surface layer is extremely acid to medium acid.

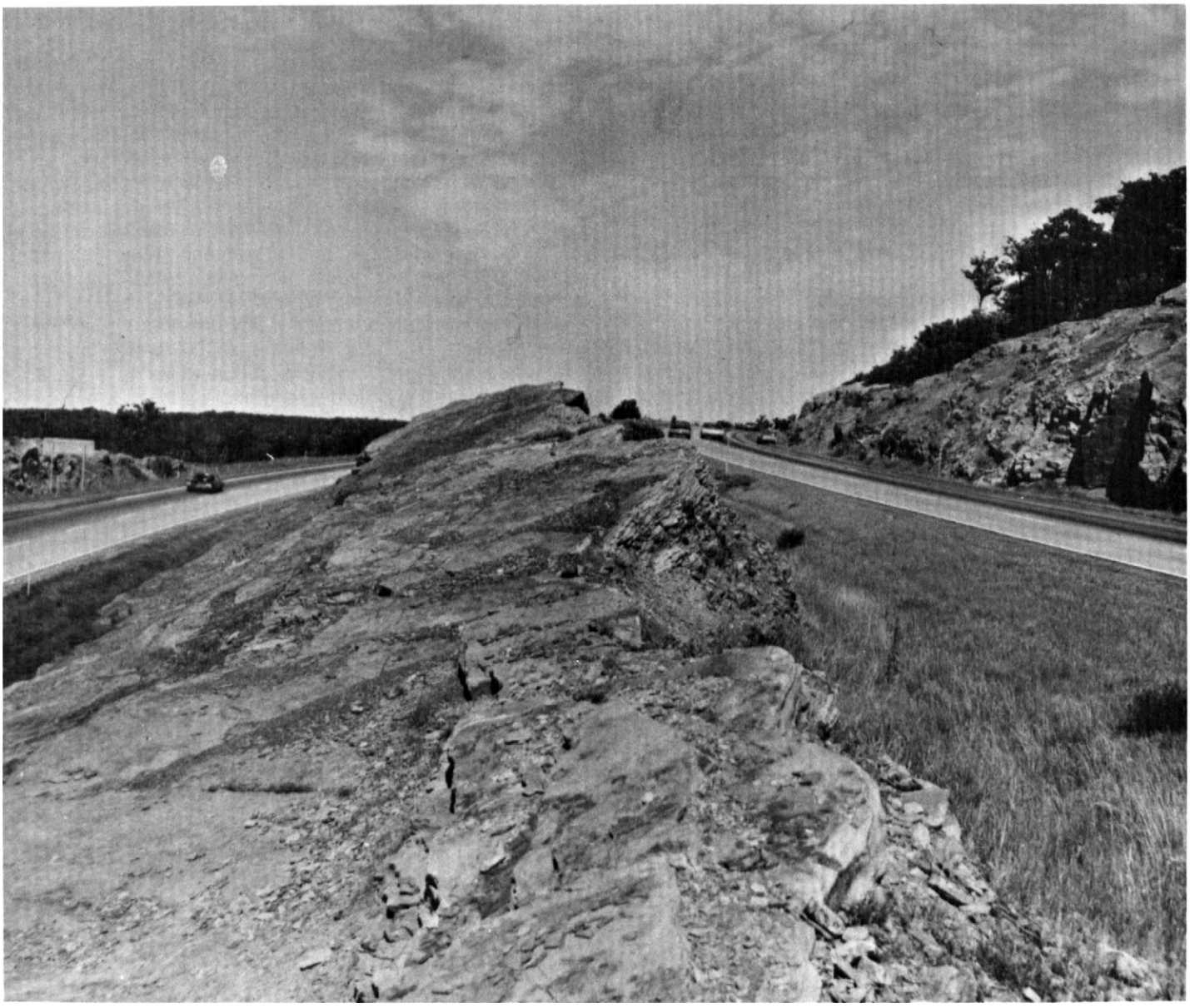


Figure 6.—Rock outcrop-Arnot complex, sloping, provides a stable foundation for a major highway. Initial construction was difficult.

Most areas are either forested or idle. A few are pastured.

This complex of rock and soil is poorly suited to crop production. The Rock outcrop and the shallowness of the soil over bedrock severely limit the use of tillage equipment. Excessive droughtiness seriously retards plant growth.

Some areas are suitable for pasture and limited hay production. Harvesting hay with modern equipment is difficult because of the Rock outcrop. Pastures are of poor quality because of droughtiness and the difficulty in reseeding and applying lime and fertilizer. Proper stocking and rotation grazing help to prolong the growth of pasture grasses during the dry summer.

This complex is poorly suited to timber production. Rock outcrop is a serious equipment limitation. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is usually required. Forested areas commonly are sparsely populated with somewhat stunted sugar maple and northern red oak.

This complex is not suited to most urban uses because of the Rock outcrop, shallowness over bedrock, and droughtiness (fig. 6). Some areas can be used for recreation uses, such as campsites, picnic areas, and hiking trails. Habitat for wildlife can be improved in many areas by hand planting food-producing shrubs.

The capability subclass is VIIs.

RKD—Rock outcrop-Arnot complex, moderately steep. This complex of exposed bedrock and the shallow, somewhat excessively drained to moderately well drained Arnot soil is on hillsides and ridges in mountainous uplands. The Arnot soil formed in a thin mantle of glacial till deposits over sandstone or shale bedrock. This moderately steep to steep complex commonly has a "stairstep" appearance on hillsides because of the ledgy, horizontal bedrock. The areas of Arnot soil are intermingled with Rock outcrop but are mainly on the lower part of slopes and on benches. The slope ranges from 15 to 35 percent but is dominantly 15 to 25 percent.

This complex is about 50 percent Rock outcrop, 40 percent Arnot channery silt loam or channery loam, and 10 percent other soils. Areas of Rock outcrop and the Arnot soil occur in such an intricate pattern that they were not mapped separately. Rock outcrop protrudes as exposed ledges and angular blocks of sandstone or shale.

Typically the Arnot soil has a surface layer of dark brown channery silt loam 4 inches thick. The subsoil is reddish brown very channery silt loam 10 inches thick. Brown and gray sandstone is at a depth of 14 inches.

Included with this complex in mapping are large areas of a very shallow soil that is similar to the Arnot soil but has bedrock within a depth of 10 inches. Also included are small areas of well drained Lordstown soils, which have bedrock at 20 to 40 inches, well drained to moderately well drained Swartswood soils, and moderately well drained to somewhat poorly drained Wurtsboro soils in a few small areas where bedrock is below 60 inches.

Where the bedrock under the Arnot soil is poorly fractured and jointed, the seasonal high water table seeps across the top of the rock for brief periods in spring. Permeability in the Arnot soil is moderate. Available water capacity is low or very low. Runoff is rapid. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Channery fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. In unlimed areas, the surface layer is extremely acid to medium acid.

Most areas are either forested or idle. A very few are pastured.

This complex of rock and soil is not suitable for crop production. The Rock outcrop, the shallowness of the soil over bedrock, and the slope severely limit the use of equipment. Excessive droughtiness seriously retards plant growth.

Some areas can be used for pasture. Erosion is a very serious hazard if the plant cover is removed. Pasture is of poor quality because of droughtiness and the extreme difficulty in reseeding and applying lime and fertilizer. Proper stocking and rotation grazing help to prolong the growth of pasture grasses during the dry summer. Overgrazing results in soil loss through erosion.

This complex is poorly suited to timber production. The Rock outcrop is a serious equipment limitation. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is required. Forested areas commonly are sparsely populated with somewhat stunted sugar maple and northern red oak.

This complex is not suited to most urban uses because of the Rock outcrop, shallowness over bedrock, slope, and droughtiness. Some areas can be used for recreation, such as skiing and hiking. Habitat for wildlife can be improved in many areas through hand planting of food-producing shrubs.

The capability subclass is VIIIs.

RKF—Rock outcrop-Arnot complex, very steep. This complex of exposed bedrock and the shallow, somewhat excessively drained to moderately well drained Arnot soil is on hillsides, sides of ravines, and valley sides of the mountainous uplands. The Arnot soil formed in a thin mantle of glacial till deposits over sandstone or shale bedrock. This very steep complex commonly has a "stairstep" appearance because of the ledgy, horizontal bedrock. The areas of Arnot soil are intermingled with the outcrops of rock but are mainly on the lower part of slopes and on benches. The slope ranges from 35 to 60 percent.

This complex is about 60 percent Rock outcrop, 30 percent Arnot channery silt loam or channery loam, and 10 percent other soils. Areas of Rock outcrop and the

Arnot soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular blocks of sandstone or shale.

Typically the Arnot soil has a surface layer of dark brown channery silt loam 3 inches thick. The subsoil is reddish brown very channery silt loam 9 inches thick. Brown and gray sandstone is at a depth of 12 inches.

Included with this complex in mapping are large areas of a very shallow soil that is similar to the Arnot soil but is only 1 to 10 inches thick over bedrock and some small areas of the well drained Lordstown soils that are 20 to 40 inches thick. Also included are deep, well drained to moderately well drained Swartswood soils and moderately well drained to somewhat poorly drained Wurtsboro soils in a few small areas where bedrock is below 60 inches.

Where the bedrock under the Arnot soil is poorly fractured and jointed, a high water table moves laterally across the top of the rock for brief periods in spring. Permeability in the Arnot soil is moderate. Available water capacity is low or very low. Runoff is rapid to very rapid. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Channery fragments make up 15 to 35 percent of the surface layer, and the content increases in the subsoil. In unlimed areas, the surface layer is extremely acid to medium acid.

Most areas of this complex are either forested or idle.

This complex of rock and soil is not suitable for crop production. Outcrops of rock, slope, and shallowness over rock prohibit the use of equipment. Excessive droughtiness seriously retards plant growth. Removal of the plant cover creates a very serious erosion hazard. Most areas are best left in natural vegetative cover.

This complex is poorly suited to pasture. Very steep slopes and areas of Rock outcrop prohibit reseeding, fertilizing, and other use of equipment. Constructing fences is difficult because of the slope. Overgrazing creates such a serious erosion hazard that many areas should not be pastured.

This complex is poorly suited to timber production. The Rock outcrop and the slope prohibit the use of equipment. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is very difficult because of the slope. Forested areas are commonly sparsely populated with somewhat stunted sugar maple and northern red oak.

This map unit is not suitable for urban and most recreation uses because of very steep slope, outcrops of rock, and shallowness over bedrock. Most areas are best left in the natural state to serve as habitat for wildlife.

The capability subclass is VIIIs.

RMC—Rock outcrop-Farmington complex, rolling. This complex of exposed bedrock and the shallow, somewhat excessively drained to well drained Farmington soils is on hills, knolls, and ridges in uplands. The Farmington soil formed in a thin mantle of glacial till deposits over limestone or limy shale bedrock. Some areas of this gently sloping to rolling complex have a "stairstep" appearance because of the ledgy bedrock. The slope ranges from 3 to 15 percent but is dominantly 8 to 15 percent. Areas are mostly long and oval and 20 to 40 acres.

This complex is about 50 percent Rock outcrop, 35 percent Farmington silt loam, loam, or fine sandy loam, and 15 percent other soils. Areas of Rock outcrop and the Farmington soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular blocks of rock.

Typically the Farmington soil has a surface layer of dark grayish brown silt loam 7 inches thick. The subsoil is yellowish brown silt loam 10 inches thick. Hard, gray limestone is at a depth of 17 inches.

Included with this complex in mapping are areas of very shallow and moderately deep soils that are similar to the Farmington soil but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included are areas of well drained Pittsfield soils that are more than 5 feet deep over bedrock. A few spots of very poorly drained Palms muck are identified by spot symbols on the soil map.

There is usually no seasonal high water table perched above the fractured, jointed, and cavernous bedrock under the Farmington soil. Permeability is moderate. Available water capacity is low or very low. Runoff is medium to rapid. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Gravel or cherty fragments make up 5 to 15 percent of the surface layer, and the content commonly increases in the subsoil. In unlimed areas, the surface layer is strongly acid to slightly acid.

Most areas of this complex are either forested or idle. Some are pastured.

This complex of rock and soil is poorly suited to crop production. The high percentage of Rock outcrop and the shallowness over bedrock severely limit the use of equipment. Excessive droughtiness seriously retards plant growth.

Some areas are suitable for pasture and for limited hay production. Hay yields are often low because of lack of moisture. Harvesting hay with modern equipment is difficult because of Rock outcrop. Pastures are of poor quality because of droughtiness and the difficulty in reseeding and applying lime and fertilizer. Proper stocking and rotation grazing help to prolong the growth of grasses during the dry summer.

This complex is poorly suited to timber production. The Rock outcrop restricts the use of equipment. Droughti-

ness causes high seedling mortality and slow growth. The restricted root zone results in windthrow. Hand planting of seedlings is usually required. Forested areas commonly are sparsely populated with such species as sugar maple and northern red oak.

This complex is poorly suited to most urban uses because of Rock outcrop, shallowness over bedrock, and droughtiness. Some areas can be used for recreation purposes such as campsites, picnic areas, horsetrails, and hiking paths. Some areas are suitable for limestone quarries.

The capability subclass is VIIs.

RMD—Rock outcrop-Farmington complex, hilly. This complex of exposed bedrock and the shallow, somewhat excessively drained to well drained Farmington soil is on hillsides, ridges, and mountainsides in uplands. The Farmington soil formed in a thin mantle of glacial till deposits over limestone or limy shale. This hilly to steep complex has a "stairstep" appearance on hillsides because of the ledgy bedrock. The slope ranges from 15 to 35 percent but is dominantly 15 to 25 percent. Areas are mostly long and oval and 10 to 50 acres.

This complex is about 60 percent Rock outcrop, 30 percent Farmington silt loam, loam, or fine sandy loam, and 10 percent other soils. Areas of Rock outcrop and the Farmington soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular blocks of bedrock.

Typically the Farmington soil has a dark grayish brown silt loam surface layer 6 inches thick. The subsoil is yellowish brown silt loam 8 inches thick. Hard gray limestone is at a depth of 14 inches.

Included with this complex in mapping are small areas of very shallow and moderately deep soils that are similar to the Farmington soil but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included are a few small areas of well drained Pittsfield soils that are more than 5 feet thick over bedrock. A few areas are very steep.

There is usually no high water table perched above the fractured, jointed, and cavernous bedrock of the Farmington soils. Permeability is moderate. Available water capacity is low or very low. Runoff is rapid on Farmington soils and very rapid on Rock outcrop. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Gravel or cherty fragments make up 5 to 15 percent of the surface layer, and the content commonly increases in the subsoil. In unlimed areas, the surface layer is strongly acid to slightly acid.

Most areas are either forested or idle. A very few areas are pastured.

This complex of rock and soil is not suitable for crop production. Rock outcrop, the shallowness over bedrock, and slope severely limit the use of modern equipment. Excessive droughtiness seriously retards plant growth. Erosion is a very serious hazard if the plant cover is removed.

Some areas of this soil can be used for pasture. Pastures are of poor quality because of droughtiness and the extreme difficulty in reseeding and applying lime and fertilizer. Proper stocking and rotation grazing help to prolong the growth of grasses during the dry summer. Overgrazing can result in erosion.

This complex is poorly suited to timber production. The Rock outcrop and slope are serious restrictions in the use of equipment. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is required. Forested areas are commonly sparsely populated with such species as sugar maple and northern red oak.

This complex is not suited to urban use because of Rock outcrop, shallowness over bedrock, slope, and droughtiness. Some areas can be used for recreation. Many areas are best suited to natural vegetation that provides food and cover for wildlife.

The capability subclass is VIIIs.

ROC—Rock outcrop-Hollis complex, sloping. This complex of exposed bedrock and the shallow, somewhat excessively drained to well drained Hollis soil is on hillcrests, hilltops, and ridges of the mountainous uplands. The Hollis soil formed in a thin mantle of glacial till deposits over schist, gneiss, or granite. This gently sloping to sloping complex has an irregular surface because of the large protruding blocks and ledges of bedrock. Areas of Hollis soil are intermingled with Rock outcrop on benches and the lower part of slopes. The slope ranges from 3 to 15 percent but is dominantly 8 to 15 percent. Areas are wide and oval and commonly 15 to 75 acres.

This complex is about 45 percent Rock outcrop, 45 percent Hollis loam, sandy loam, gravelly sandy loam, or gravelly loam, and 10 percent other soils. Areas of Rock outcrop and the Hollis soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular blocks of gneiss, schist, and granite.

Typically the Hollis soil has a thin organic leafmat over a dark brown gravelly loam surface layer 4 inches thick. The subsoil is strong brown gravelly loam 10 inches thick. Hard gray granite is at a depth of 14 inches.

Included with this complex in mapping are small areas of a very shallow soil and a moderately deep soil that are similar to the Hollis soil but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included where the soil mantle is thicker than 5 feet are some areas of the well drained Charlton soils and well drained Paxton soils, which have a fragipan. Pockets of Palms muck and a few spots of a poorly drained, very stony mineral soil are identified by spot symbols on the soil map.

No free water is perched above the bedrock in the Hollis soil except in areas where the rock is poorly joint-

ed. In these areas there is a perched water table only for short periods early in spring. Permeability is moderate or moderately rapid. Available water capacity is low or very low. Runoff is medium to rapid on the Hollis soil and is rapid on the Rock outcrop. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. The surface layer and subsoil are 2 to 25 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this complex are forested. In some areas the plant cover is sparse because of the high percentage of exposed bedrock.

This complex of rock and soil is poorly suited to crops. Rock outcrop and shallowness over bedrock severely limit the use of modern equipment. Excessive droughtiness severely retards plant growth.

Some areas are suitable for pasture and limited hay production. Hay yields are often low and harvest difficult because of the numerous areas of Rock outcrop. Pastures are of poor quality because of droughtiness and the difficulty in reseeding and applying lime and fertilizer. Proper stocking and rotation grazing help to prolong the growth of grasses in the dry summer.

This complex is poorly suited to timber production. Rock outcrop is a serious equipment limitation. Droughtiness results in high seedling mortality and slow growth. The shallow root zone causes windthrow. Hand planting of seedlings is usually required. Forested areas commonly are sparsely populated with such species as sugar maple, northern red oak, and white pine.

This complex is poorly suited to most urban uses because of Rock outcrop, shallowness over bedrock, and droughtiness. Some areas can be used for recreation uses such as campsites, picnic areas, and hiking trails. Areas left in natural vegetative cover provide habitat for woodland wildlife.

The capability subclass is VIIs.

ROD—Rock outcrop-Hollis complex, moderately steep. This complex of exposed bedrock and the shallow, somewhat excessively drained to well drained Hollis soil is on hillcrests, hilltops, and ridges of the mountainous uplands. The Hollis soil formed in a thin mantle of glacial till deposits over schist, gneiss, or granite bedrock. This moderately steep to steep complex has an irregular surface because of the large protruding blocks and ledges of exposed bedrock. Areas of the Hollis soil are closely intermingled with Rock outcrop on benches and the lower part of slopes. The slope ranges from 15 to 35 percent but is dominantly 15 to 25 percent. Areas are long and narrow and commonly 15 to 150 acres.

This complex is about 45 percent Rock outcrop, 45 percent Hollis loam, sandy loam, gravelly loam, or gravelly sandy loam, and 10 percent other soils. Areas of Rock outcrop and the Hollis soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular blocks of gneiss, schist, and granite.

Typically the Hollis soil has a thin organic leafmat over a dark brown gravelly loam surface layer 4 inches thick. The subsoil is strong brown gravelly loam 9 inches thick. Hard gray granite is at a depth of 13 inches.

Included with this complex in mapping are small areas of a very shallow soil and a moderately deep soil that are similar to the Hollis soil but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included where depth to bedrock is more than 5 feet are some areas of well drained Charlton soils and well drained Paxton soils, which have a fragipan. In some small areas the surface layer is severely eroded.

No free water is perched above the bedrock in the Hollis soil except in areas where the rock is poorly jointed. In these areas there is a perched water table only for a short period early in spring. Permeability is moderate or moderately rapid. Available water capacity is low or very low. Runoff is rapid in Hollis soil and is very rapid on the areas of Rock outcrop. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. The surface layer and subsoil are 2 to 25 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this complex are forested. Plant cover is sparse in areas of exposed bedrock.

This complex of rock and soil is not suited to crop production. Rock outcrop, shallowness over bedrock, and slope severely limit the use of modern equipment. Excessive droughtiness severely retards plant growth. Erosion is a very serious hazard if the plant cover is removed.

Some areas can be used for pasture. Pastures are very poor in quality, however, because of droughtiness and the extreme difficulty in reseeding and applying lime and fertilizer. Proper stocking and rotation grazing prolong the growth of grasses in the dry summer. Overgrazing can result in erosion.

This complex is poorly suited to timber production. Rock outcrop and slope prevent the use of most equipment. Droughtiness results in high seedling mortality and slow growth. The shallow root zone causes windthrow. Hand planting of seedlings is required. Forested areas commonly are sparsely populated with such species as sugar maple, northern red oak, and white pine.

This complex is not suited to most urban uses because of Rock outcrop, shallowness over bedrock, slope, and droughtiness. Some areas can be used for recreation such as skiing and hiking. Naturally vegetated areas provide food and cover for woodland wildlife.

The capability subclass is VIIIs.

ROF—Rock outcrop-Hollis complex, very steep. This complex of exposed bedrock and the shallow, somewhat excessively drained to well drained Hollis soils

is on hillsides and valley sides of the mountainous uplands. The Hollis soil formed in a thin mantle of glacial till deposits overlying schist, gneiss, or granite. This very steep complex generally has an irregular surface because of the protruding blocks and ledges of exposed bedrock. The areas of Hollis soil are intermingled with Rock outcrop but are mainly on the lower slopes and on benches. The slope ranges from 35 to 60 percent. Areas are mostly long and narrow and 15 to 50 acres.

The complex is about 50 percent Rock outcrop, 40 percent Hollis loam, sandy loam, gravelly loam, or gravelly sandy loam, and 10 percent other soils. Areas of Rock outcrop and the Hollis soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular blocks of gneiss, schist, and granite rock.

Typically the Hollis soil has a thin organic leafmat over a dark brown gravelly loam surface layer 3 inches thick. The subsoil is strong brown gravelly loam 8 inches thick. Hard, gray granite is at a depth of 11 inches.

Included with this complex in mapping are areas of a very shallow soil and a moderately deep soil that are similar to the Hollis soil but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included where depth to bedrock is more than 5 feet are some areas of well drained Charlton soils and well drained Paxton soils, which have a fragipan. In some areas the surface layer of the Hollis soil is severely eroded.

In the Hollis soil no free water is perched above the bedrock except in areas where the rock is poorly jointed. In these areas the perched water table moves laterally across the top of the rock for only a short period early in spring. Permeability is moderate or moderately rapid. Available water capacity is low or very low. Runoff is rapid to very rapid. Bedrock is at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. The surface layer and subsoil are 2 to 25 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this complex are forested. Plant cover is sparse in areas of exposed bedrock.

This complex of rock and soil is not suitable for crops. Rock outcrop, very steep slopes, and shallowness over bedrock prevent the use of equipment. Excessive droughtiness severely retards plant growth. Removing vegetation creates a very serious erosion hazard.

This map unit is generally not suited to pasture. Very steep slopes and the Rock outcrop prevent reseeding, fertilizing, and other use of equipment. Constructing fences is very difficult because of slope and shallowness over rock. Overgrazing creates a serious erosion hazard.

This complex is poorly suited to timber production. The Rock outcrop and the slope prevent equipment use. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is very difficult because of the slope. Forested areas commonly are sparsely populated with such species as sugar maple, northern red oak, and white pine.

This complex is not suited to urban uses or most recreation uses because of very steep slope, Rock outcrop, and shallowness over bedrock. Most areas are best left in natural plant cover to provide habitat for wildlife.

The capability subclass is VIIIs.

RSB—Rock outcrop-Nassau complex, undulating. This complex consists of exposed bedrock and the shallow, somewhat excessively drained Nassau soil. It is on upland ridges, knolls, and hilltops that have irregular sloping topography. The Nassau soil formed in a thin mantle of glacial till deposits over shale or slate bedrock. This undulating or gently sloping complex has an irregular sloping surface because of the tilted and folded bedrock. The slope ranges from 3 to 8 percent. Areas are mostly oval and 20 to 60 acres. The complex is about 50 percent Rock outcrop, 35 percent Nassau shaly silt loam, shaly loam, and very shaly silt loam, and 15 percent other soils. Areas of Rock outcrop and the Nassau soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular beds of tilted and folded shale and slate bedrock.

Typically the Nassau soil has a dark grayish brown shaly silt loam surface layer 10 inches thick. The subsoil is yellowish brown very shaly silt loam 8 inches thick. Hard, black tilted shale is at a depth of 18 inches.

Included with this complex in mapping are small areas of a very shallow soil and a moderately deep soil that are similar to the Nassau soil but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included are some interridge areas of well drained Bath soils where the depth to bedrock is more than 40 inches. A few spots of very poorly drained Alden soils in depressions and Palms muck in small deep depressions are identified by spot symbols on the soil map. In some areas the slope is 8 to 15 percent.

In the Nassau soil a seasonal high water table is seldom perched above the bedrock. Permeability is moderate. Available water capacity is low or very low. Runoff is medium on the Nassau soil and is rapid on the exposed shale bedrock. Bedrock underlies the Nassau soil at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to the Rock outcrop; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Shale fragments make up 15 to 40 percent of the surface layer, and the content increases in the subsoil. In unlimed areas, the surface layer is very strongly acid to strongly acid.

Most areas of this complex are either forested or idle. Some are pastured.

This complex of rock and soil is poorly suited to cultivated crops. Rock outcrop and shallowness over bed-

rock severely limit the use of modern equipment. Excessive droughtiness restricts plant growth.

In some areas this complex is suitable for pasture and limited hay production. Harvesting and reseeding hay with modern equipment are difficult because of Rock outcrop. Pastures are poor in quality because of droughtiness. Reseeding and applying lime and fertilizer are somewhat difficult because of the Rock outcrop. Proper stocking and rotation grazing help to prolong pasture seedings.

This complex is poorly suited to timber production. The Rock outcrop seriously limits equipment use. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is usually required. Forested areas commonly are sparsely populated with such species as sugar maple, northern red oak, and white pine.

This complex is poorly suited to most urban uses because of Rock outcrop, shallowness over bedrock, and droughtiness. Careful site selection is required for dwellings. Some areas can be used for campsites, picnic areas, and hiking trails. Small stones are bothersome for some uses. Many areas provide wooded habitat for wildlife.

The capability subclass is VIIs.

RSD—Rock outcrop-Nassau complex, hilly. This complex consists of exposed bedrock and the shallow, somewhat excessively drained Nassau soil. It is on upland hills, ridge sides, and valley sides that have irregular sloping topography. The Nassau soil formed in a thin mantle of glacial till deposits over shale or slate bedrock. This hilly to steep complex usually has an irregular sloping surface because of the tilted and folded bedrock. The slope ranges from 15 to 35 percent but is dominantly 15 to 25 percent. Areas are mostly long and narrow and 20 to 50 acres.

The complex is about 55 percent Rock outcrop, 35 percent Nassau shaly silt loam, shaly loam, or very shaly silt loam, and 10 percent other soils. Areas of Rock outcrop and the Nassau soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular beds of tilted and folded shale or slate bedrock.

Typically the Nassau soil has a surface layer of dark grayish brown shaly silt loam 10 inches thick. The subsoil is yellowish brown very shaly silt loam 8 inches thick. Hard, black tilted shale is at a depth of 18 inches.

Included with this complex in mapping are small areas of a very shallow soil and a moderately deep soil that are similar to the Nassau soil but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included are spots of the well drained Bath soils where the depth to bedrock is more than 40 inches, a few areas that are severely eroded, and some areas where the slope is 8 to 15 percent.

In the Nassau soils a seasonal high water table is seldom perched above the bedrock. Permeability is moderate. Available water capacity is low or very low. Runoff is rapid on the Nassau soil and is very rapid on the Rock outcrop. Bedrock underlies the Nassau soil at a depth of 10 to 20 inches. It restricts roots. A few plants are anchored to outcrops of rock; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Shale fragments make up 15 to 40 percent of the surface layer, and the content increases in the subsoil. In unlimed areas, the surface layer is very strongly acid to strongly acid.

Most areas are either forested or idle. A very few areas are pastured.

This complex of rock and soil is not suitable for cultivated crops or for hay. Rock outcrop, shallowness over bedrock, and slope severely limit the use of modern equipment. Excessive droughtiness restricts plant growth. Erosion is a very serious hazard if the plant cover is removed.

In some areas this complex can be used for pasture. Pastures are poor in quality, however, because of droughtiness and the extreme difficulty in reseeding and applying lime and fertilizer. Proper stocking and rotation grazing help to prolong the growth of pasture grasses in dry summer months. Overgrazing results in serious erosion.

This complex is poorly suited to timber production. The Rock outcrop and the slope seriously limit equipment use. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is required. Forested areas commonly are sparsely populated with such species as sugar maple, northern red oak, and white pine.

This complex is not suited to most urban uses because of Rock outcrop, shallowness over bedrock, slope, and droughtiness. Some areas are suitable for recreation such as skiing and hiking. Naturally vegetated areas provide habitat for wildlife.

The capability subclass is VIIIs.

RSF—Rock outcrop-Nassau complex, very steep. This complex of exposed bedrock and the shallow, somewhat excessively drained Nassau soil is on hillsides, sides of ravines, and valley sides of the mountainous uplands. The Nassau soil formed in a thin mantle of glacial till deposits over shale or slate bedrock. This very steep complex has an irregular sloping surface because of the tilted and folded bedrock. The slope ranges from 35 to 45 percent. Areas are commonly long and narrow and 20 to 50 acres.

The complex is about 60 percent Rock outcrop, 30 percent Nassau shaly silt loam, shaly loam, or very shaly silt loam, and 10 percent other soils. Areas of Rock outcrop and the Nassau soil occur in such an intricate pattern that they were not mapped separately. The Rock outcrop protrudes as exposed ledges and angular beds of tilted and folded shale or slate bedrock.

Typically the Nassau soil has an 8 inch thick surface layer of dark grayish brown shaly silt loam. The subsoil is

yellowish brown very shaly silt loam 6 inches thick. Hard, black tilted shale is at a depth of 14 inches.

Included with this complex in mapping are small areas of a very shallow soil and a moderately deep soil that are similar to Nassau soils but have bedrock at depths of 1 to 10 inches and 20 to 40 inches respectively. Also included are spots of well drained Bath soils where the depth to bedrock is more than 40 inches, some areas that are severely eroded, and a few small areas where the slope is as much as 60 percent.

In Nassau soils the water table is seldom perched above the bedrock. Permeability is moderate. Available water capacity is low or very low. Runoff is rapid to very rapid on Nassau soils and is very rapid on the Rock outcrop. Bedrock underlies Nassau soils at depths of 10 to 20 inches. It restricts roots. A few plants are anchored to outcrops of rock; the roots penetrate along fractures and crevices in the rock. Natural organic matter content is low. Shale fragments make up 15 to 40 percent of the surface layer and the content increases in the subsoil. In unlimed areas, the surface layer is very strongly acid to strongly acid.

Most areas are either forested or idle.

This complex of rock and soil is not suitable for crops. Rock outcrop, slope, and shallowness over bedrock prevent the use of equipment. Excessive droughtiness restricts plant growth. Removing vegetation creates a very serious hazard of erosion. Most areas are best left in natural plant cover.

This complex is poorly suited to pasture. Very steep slopes and the Rock outcrop prevent reseeding, fertilizing, and other use of equipment. Constructing fences is very difficult because of the slope. Overgrazing creates such a serious erosion hazard that most areas should not be pastured.

This complex is poorly suited to timber production. The Rock outcrop and the slope prevent equipment use. Droughtiness causes high seedling mortality and slow growth. The shallow root zone results in windthrow. Hand planting of seedlings is very difficult because of the slope. Forested areas commonly are sparsely populated with such species as sugar maple and northern red oak, which are somewhat stunted.

This complex is not suited to urban and most recreation uses because of the very steep slope, Rock outcrop, and shallowness over bedrock. Most areas are best left in the natural plant cover to serve as habitat for wildlife.

The capability subclass is VIIIs.

Sb—Scarboro mucky sandy loam. This deep, very poorly drained, nearly level soil formed in sandy glacial outwash deposits. It is in depressions and concave basins on remnant deltas, terraces, and lowland plains. Areas are small and round and commonly 5 to 10 acres.

Typically the surface layer is very dark gray mucky sandy loam 10 inches thick. The subsurface layer is dark gray sand 5 inches thick. The upper part of the substratum to 40 inches is dark olive gray coarse sand. The lower part to a depth of 60 inches is dark gray fine sand.

Included with this soil in mapping are spots of very poorly drained Palms muck. Also included are a few small areas where the surface layer and subsoil are very gravelly and a few small slightly higher areas of a sandy soil that is similar to Scarboro soil but is somewhat poorly drained.

The water table in this Scarboro soil is at or near the surface throughout most of the year. Ponding is common in some areas in spring. Permeability is rapid or very rapid. Available water capacity is low to moderate, but there is generally enough moisture to sustain plant growth. Runoff is very slow. Roots are restricted to the surface layer and the upper part of the subsoil by the prolonged high water table. Some roots extend deeper as the water table drops in midsummer. Natural organic matter content is high. The soil is generally gravel free, but in a few areas it is as much as 10 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this soil are either idle or wooded and support only plants that tolerate wetness.

This soil is not suitable for crops unless it is drained. Locating drainage outlets is often difficult because of the low position in the landscape. Where drainage outlets are available, open ditches that lower the water table generally provide adequate drainage. Wrapping the joints of subsurface drains prevents plugging by sand. If adequately drained and fertilized, this soil is productive of many field crops and some vegetable crops. Minimum tillage, cover crops, return of crop residue, sod crops in the cropping system, and tillage at the proper moisture content are needed to maintain tilth and high organic matter content.

If partial drainage is feasible, this soil can be used for pasture. Grazing in wet periods compacts the soil and destroys desirable grasses. Rotation grazing, proper stocking, and restricted grazing in wet periods are needed to maintain pasture seedings.

Wetness limits suitability for timber production. However, species such as red maple and northern white cedar are suited. Windthrow and seedling mortality are serious hazards. Equipment use is limited by wetness.

This soil is poorly suited to urban uses because of prolonged wetness. Some areas are suitable for the development of wildlife marshes.

The capability subclass is Vw.

ScA—Scio silt loam, 0 to 3 percent slopes. This deep, moderately well drained, nearly level soil formed in glacial lake-laid deposits that are dominantly silt and very fine sand. It is on alluvial fans and terraces in valleys and on lowland plains. A few small areas are on upland benches. Areas are mostly oval and 10 to 15 acres.

Typically the surface layer is dark brown silt loam 8 inches thick. The subsoil is 28 inches thick. The upper 7 inches is yellowish brown silt loam, and the lower 21 inches is mottled dark yellowish brown silt loam. The substratum from 36 to 60 inches is friable, dark brown heavy silt loam.

Included with this soil in mapping are small areas of the well drained Unadilla soils on slightly higher knolls and somewhat poorly drained to poorly drained Raynham soils in slight depressions. Poorly drained and very poorly drained Canandaigua soils in a few small deep depressions are identified by spot symbols on the soil map.

The water table in this Scio soil rises into the lower part of the subsoil early in spring and in other extended wet periods. Permeability is moderate in the surface layer and subsoil and moderately rapid or rapid in the substratum. Available water capacity is high, and runoff is slow. Roots are not restricted, and some extend into the substratum. Natural organic matter content is low. The surface layer and subsoil are no more than 3 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas are farmed. A few are used for urban purposes.

This nearly level, gravel-free soil is easy to till once it dries in spring. It is suited to cultivated crops, small grain, and hay. In some areas it is also suited to vegetable crops. Seasonal wetness slightly delays tillage and planting. Random subsurface drains to the few included wet spots improve some fields. Minimum tillage, cover crops, return of crop residue to the soil, and tillage at the proper moisture content help to maintain tilth, increase organic matter content, and allow more intensive cropping of the soil.

Pasture grasses do well on this soil. Grazing when the soil is wet early in spring compacts the soil and destroys desirable grasses. Rotation grazing, proper stocking, and restricted grazing in wet periods are needed to maintain pasture seedings.

Suitability for timber production is good. The few wooded areas support such species as northern red oak, white ash, and sugar maple. Erosion, windthrow, and seedling mortality are generally not problems.

This soil can be used for some urban uses, but seasonal wetness is a limitation. Properly designing and installing drains around foundations of dwellings minimizes the problem of the high water table. Pollution of the water table by effluent from septic tank absorption fields is a hazard because of the moderately rapid or rapid permeability in the substratum. Some areas are suited to recreation purposes, such as athletic fields and playgrounds which require a nearly level gravel-free site.

The capability subclass is IIw.

ScB—Scio silt loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil formed in glacial lake-laid deposits that are dominantly silt and very fine sand. It is on alluvial fans and terraces in valleys and on undulating plains. A few small areas are on upland benches. Areas are mostly oval and 10 to 15 acres.

Typically the surface layer is dark brown silt loam 8 inches thick. The subsoil is 27 inches thick. The upper 7 inches is yellowish brown silt loam, and the lower 20 inches is mottled dark yellowish brown silt loam. The substratum to 60 inches is friable, dark brown heavy silt loam.

Included with this soil in mapping are small areas of the well drained Unadilla soils on slightly higher knolls and the somewhat poorly drained to poorly drained Raynham soils in slight depressions. Poorly drained and very poorly drained Canandaigua soils in a few small deep depressions are identified by spot symbols on the soil map. In a few spots the surface layer is gravelly.

The water table rises into the lower part of the subsoil in the early part of spring and in other extended wet periods. Permeability is moderate in the surface layer and subsoil and is moderately rapid or rapid in the substratum. Available water capacity is high, and runoff is medium. Roots are not restricted; some extend into the substratum. Natural organic matter content is low. The surface layer and subsoil are no more than 3 percent gravel fragments. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this soil are farmed. A few areas are used for urban purposes or are wooded.

Once this gently sloping, gravel-free soil dries in spring, it is easy to till. It is suited to cultivated crops, small grain, and hay. In some areas it is also suited to vegetable crops. It is highly susceptible to erosion on long slopes and in areas left bare of plant cover. Seasonal wetness slightly delays tillage and planting. Interceptor drains that divert runoff from higher adjacent soils and random subsurface drains to the few included wet spots improve some fields. Minimum tillage, cover crops, return of crop residue, tillage at the proper moisture content, cross-slope tillage, and sod crops in the cropping system are needed to control erosion and maintain tilth.

Pasture grasses do well on this soil. Grazing when the soil is wet early in spring compacts the soil and destroys desirable grasses. Rotation grazing, proper stocking, and restricted grazing in wet periods are needed to maintain pasture seedings and reduce the erosion hazard.

Suitability for timber production is good. The few wooded areas support such species as northern red oak, white ash, and sugar maple. Equipment limitation, windthrow, and seedling mortality are generally not problems. Logging trails should be laid out across the slope to prevent trailside gullying.

This soil can be used for some urban uses but seasonal wetness is a limitation. Properly designed and installed foundation drains and interceptor drains minimize the problem of the high water table and lateral seepage. Pollution of the water table by effluent from septic tank absorption fields is a hazard because of the moderately rapid or rapid permeability in the substratum. Some areas are suited to recreation purposes such as picnic areas, campsites, and hiking trails. Some areas are good sources of topsoil.

The capability subclass is IIe.

Su—Suncook sandy loam. This deep, excessively drained, nearly level soil formed in sandy alluvial deposits. It is on flood plains adjacent to streams that periodically overflow. The slope is no more than 3 percent. Areas are long and narrow and commonly 5 to 20 acres.

Typically the surface layer is very dark gray sandy loam 4 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy fine sand in the upper part, very dark gray fine sand in the middle part, and mixed stratified sands in the lower part.

Included with this soil in mapping are a few areas of the well drained silty Tioga soils and spots of the moderately well drained to somewhat poorly drained Middlebury soils in slightly lower areas. In a few areas the surface layer and subsoil are gravelly.

This Suncook soil is commonly subject to flooding for brief periods in spring and other periods of extremely heavy runoff. Depth to the water table is usually greater than 3 feet. The level of the water table is controlled partly by the water level in the adjacent stream. Permeability is rapid or very rapid. Available water capacity is very low or low, and runoff is slow. Roots are not restricted; some extend to 40 inches or more. Natural organic matter content is low. The soil is generally gravel free, but in some areas the content is as much as 10 percent in the surface layer and subsoil. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this soil are farmed.

This soil is moderately suited to cultivated crops, small grain, and hay. It is easy to cultivate and keep in good tilth. Droughtiness in midsummer is a limitation for optimum yields. Deep-rooted crops, such as alfalfa hay, are generally better suited than shallow-rooted crops because they can obtain moisture from deep in the substratum. This nearly level soil is well suited to sprinkler irrigation systems for high value crops. Flooding is generally not a hazard during the growing season, but in spring it can cause surface scour, streambank erosion, and siltation and deposition of debris in low areas. Practices that reduce the hazard of scour and increase organic matter content, which improves water holding capacity, include minimum tillage, cover crops, return of crop residue, and sod crops in the cropping system.

This soil is suited to pasture grasses although growth is often slow in midsummer because of droughtiness. Proper stocking, restricted grazing in dry periods, and rotation grazing are needed to maintain pasture seedings.

Suitability for timber production is fair to poor. Woodlots commonly support such species as northern red oak and eastern white pine. High seedling mortality is a serious problem because of summer droughtiness. Seedlings should be planted early in spring.

This soil is not suited to most urban uses because of the flood hazard. Some areas can be used for campsites, picnic areas, hiking trails, or athletic fields, but maintaining a thick sod cover is difficult because of droughtiness. Recreation facilities should be anchored because of the hazard of flooding.

The capability subclass is IIIs.

SwB—Swartswood gravelly loam, 3 to 8 percent slopes. This deep, well drained and moderately well drained, gently sloping soil formed in glacial till deposits derived from gray and brown conglomerate and sandstone. It has a fragipan in the lower part of the subsoil. It is on convex hilltops and ridges in uplands. Areas are mostly oval and 10 to 20 acres.

Typically the surface layer is very dark grayish brown gravelly loam 1 inch thick. The subsoil is 61 inches thick. The upper 18 inches is strong brown gravelly loam, the next 8 inches is yellowish brown gravelly fine sandy loam, and the next 4 inches is mottled yellowish brown gravelly fine sandy loam. The lower 31 inches is a brown gravelly fine sandy loam, firm and brittle fragipan. The substratum to a depth of 70 inches is brown gravelly fine sandy loam.

Included with this soil in mapping are the moderately well drained to somewhat poorly drained Wurtsboro soils on foot slopes and in nearly level areas. Pockets of the very poorly drained Alden soils and a few areas of Palms muck in depressions are identified by spot symbols on the soil map. In a few areas large stones and boulders are on the surface.

The water table in this Swartswood soil is commonly perched above the fragipan for brief periods in spring. Depth to the pan is 25 to 35 inches. Permeability is moderate above the pan and is slow or moderately slow in the pan and substratum. Available water capacity is low to moderate. Runoff is slow to medium. Root penetration is good above the fragipan, but few roots penetrate the dense pan. Natural organic matter content is low. Gravel fragments make up 15 to 35 percent of the surface layer and upper part of the subsoil. In unlimed areas, the surface layer is extremely acid to strongly acid.

Many areas of this soil are forested. Some are farmed, and a few are idle or used for urban development.

This soil is suited to cultivated crops, small grain, and hay. Erosion is a hazard, particularly on long slopes. Because of the restricted root zone, droughtiness sometimes limits crop production. Gravel fragments are slightly bothersome for some kinds of planting and tillage and cause excessively rapid wear of equipment. Random subsurface drains to the included wet spots improve some fields. Cross-slope tillage, cover crops, return of crop residue, tillage at the proper moisture content, and sod crops in the cropping system are needed to control erosion, promote tilth, and increase organic matter content. Increasing organic matter content improves available water capacity.

This soil is well suited to pasture grasses. Rotation grazing, restricted grazing when the soil is wet early in spring, and lime and fertilizer are needed to maintain pasture seedings.

Suitability for timber production is good to fair. Woodlots commonly support such trees as northern red oak, sugar maple, and white ash. There is generally little hazard of erosion, seedling mortality, or windthrow and few limitations in the use of equipment.

Slow or moderately slow permeability in the fragipan, temporary wetness in spring, and small stones are limitations for urban uses. Careful installation of drains around foundations of dwellings minimizes the hazard of lateral seepage across the top of the fragipan early in spring. Many areas are suitable for recreation uses such as campsites, picnic areas, and hiking paths, but small stones are somewhat bothersome.

The capability subclass is IIe.

SwC—Swartswood gravelly loam, 8 to 15 percent slopes. This deep, well drained and moderately well drained, sloping soil formed in glacial till deposits derived from gray and brown conglomerate and sandstone. It has a fragipan in the lower part of the subsoil. It is on convex hillcrests, hillsides, and ridges in uplands. Areas are mostly oval and 10 to 20 acres.

Typically the surface layer is very dark grayish brown gravelly loam 1 inch thick. The subsoil is 61 inches thick. The upper 18 inches is strong brown gravelly loam, the next 8 inches is yellowish brown gravelly fine sandy loam, and the next 4 inches is mottled yellowish brown gravelly fine sandy loam. The lower 31 inches is a brown gravelly fine sandy loam, firm and brittle fragipan. The substratum to a depth of 70 inches is brown gravelly fine sandy loam.

Included wih this soil in mapping are moderately well drained to somewhat poorly drained Wurtsboro soils on foot slopes. Pockets of very poorly drained Alden soils and a few areas of Palms muck in depressions are indicated by spot symbols on the soil map. In some areas large stones and boulders are on the surface.

The water table in this Swartswood soil is commonly perched above the fragipan for brief periods in spring. Depth to the pan is 25 to 35 inches. Permeability is moderate above the pan and is slow or moderately slow in the pan and substratum. Available water capacity is low to moderate. Runoff is medium. Root penetration is good above the fragipan, but few roots penetrate the dense pan. Natural organic matter content is low. The surface layer and upper part of the subsoil are 15 to 35 percent gravel fragments. In unlimed areas, the surface layer is extremely acid to strongly acid.

This soil is moderately suited to cultivated crops, small grain, and hay. Erosion is a serious hazard, particularly on long slopes. Because the root zone is restricted, droughtiness sometimes limits optimum crop production. Gravel fragments are slightly bothersome for some kinds of planting and tillage and cause excessively rapid wear of equipment. Random subsurface drains to the included wet spots and a few interceptor drains that divert seepage and runoff from higher soils improve some fields. Cross-slope tillage, stripcropping, cover crops, return of crop residue, tillage at the proper moisture content, and sod crops in the cropping system are needed to control erosion, preserve tilth, and increase organic matter content, which improves available water capacity.

This soil is suited to pasture grasses. Rotation grazing, restricted grazing when the soil is wet early in spring, and lime and fertilizer are needed to maintain pasture seedings.

Suitability for timber production is good to fair. Woodlots commonly support such species as northern red oak, sugar maple, and white ash. Equipment limitation, seedling mortality, and windthrow are generally not problems. Logging trails should be laid out across the slope to prevent trail erosion and gullying.

Slow or moderately slow permeability in the pan, slope, temporary wetness in spring,. and small stones are limitations for urban uses. Careful installation of drains around foundations of dwellings minimizes the hazard of lateral seepage across the top of the pan early in spring. Many areas can be used for recreation purposes such as campsites, picnic areas, and hiking paths, but small stones and slope are somewhat bothersome.

The capability subclass is IIIe.

SwD—Swartswood gravelly loam, 15 to 25 percent slopes. This deep, well drained and moderately well drained, moderately steep soil formed in glacial till deposits derived from gray and brown conglomerate and sandstone. It has a fragipan in the lower part of the subsoil. It is on hillsides and valley sides in uplands. Areas are mostly long and narrow and 5 to 25 acres.

Typically the surface layer is very dark grayish brown gravelly loam 1 inch thick. The subsoil is 55 inches thick. The upper 17 inches is strong brown gravelly loam, the next 7 inches is yellowish brown gravelly fine sandy loam, and the next 3 inches is mottled yellowish brown gravelly fine sandy loam. The lower 28 inches is a brown gravelly fine sandy loam, firm and brittle fragipan. The substratum to a depth of 70 inches is brown gravelly fine sandy loam.

Included with this soil in mapping are moderately well drained to somewhat poorly drained Wurtsboro soils on foot slopes. Also included are a few areas where large stones and boulders are on the surface and some areas that are severely eroded.

For brief periods in spring, the water table commonly moves across the top of the fragipan, which is at depths of 25 to 35 inches. Permeability is moderate above the pan and is slow and moderately slow in the pan and substratum. Available water capacity is low to moderate. Runoff is rapid. Root penetration is good above the fragipan, but few roots penetrate the dense pan. Natural organic matter content is low. The surface layer and upper part of the subsoil are 15 to 35 percent gravel fragments. In unlimed areas, the surface layer is extremely acid to strongly acid.

Most areas of this soil are either forested or idle. A few are pastured.

This soil is poorly suited to cultivated crops because of the slope and the serious hazard of erosion. Some areas are suitable for hay crops. The hazard of erosion is particularly severe on long slopes, or in areas where the plant cover has been removed. Because of the restricted root zone, droughtiness sometimes limits plant growth. The moderately steep slopes make the use of equipment somewhat difficult. Cultivated crops should be grown infrequently and under maximum conservation measures, including cross-slope tillage, stripcropping, diversions, cover crops, and sod crops in the cropping system a high proportion of the time.

This soil is suited to pasture grasses. Rotation grazing, restricted grazing when the soil is wet early in spring, and lime and fertilizer are needed to maintain pasture seedings. Reseeding and fertilizing are somewhat difficult because of slope.

Suitability for timber production is good to fair. Woodlots commonly support such trees as northern red oak, sugar maple, and white ash. Seedling mortality and windthrow are generally not hazards. Slope limits the use of some equipment. Logging trails should be laid out across the slope to prevent trail erosion and gullying.

This soil is poorly suited to urban uses because of slow or moderately slow permeability in the fragipan and moderately steep slopes. Some areas can be used for certain recreation uses, including hiking and horseback riding. Forested areas provide habitat for wildlife.

The capability subclass is IVe.

SXC—Swartswood and Mardin very stony soils, sloping. This map unit consists of well drained and moderately well drained Swartswood soil and moderately well drained Mardin soil. Some areas are Swartswood soil, other areas are Mardin soil, and a few include both soils. These deep soils have a fragipan. They formed in glacial till deposits on hill crests, hilltops, and ridges in uplands. The slope is dominantly 8 to 15 percent but ranges from 3 to 15 percent. The surface layer texture, excluding large stones, is gravelly loam, gravelly silt loam, gravelly fine sandy loam, or channery sandy loam. Stones and boulders greater than 10 inches in diameter are about 5 to 30 feet apart on the surface. Areas are round or oval and mostly 10 to 100 acres.

Typically the Swartswood soil has a 3-inch surface layer of very dark grayish brown gravelly loam. The subsoil is 59 inches thick. The upper part is strong brown gravelly loam over mottled yellowish brown gravelly fine sandy loam. From 31 to 62 inches is a brown gravelly fine sandy loam, firm and brittle fragipan. The substratum to a depth of 70 inches is brown gravelly fine sandy loam.

Typically the Mardin soil has a 6-inch surface layer of dark brown gravelly silt loam. The upper 6 inches of subsoil is yellowish brown gravelly silt loam. Under this is a thin leached layer of mottled pale brown gravelly silt loam. From 17 to 60 inches is a firm, olive brown channery silt loam fragipan.

Included with these soils in mapping are a few small areas that are free of large surface stones. Also included on a few foot slopes are the moderately well drained to somewhat poorly drained Wurtsboro soils or somewhat poorly drained Erie soils. A few spots of the very poorly drained Alden soils and Palms muck in depressions are identified by spot symbols on the soil maps.

In both Swartswood and Mardin soils the water table is perched above the fragipan early in spring. Permeability is moderate above the pan in both soils. It is slow or moderately slow in the pan and substratum in the Swartswood soil and is slow or very slow in the Mardin soil. Available water capacity is low to moderate, and runoff is medium in both soils. Roots are restricted by the dense fragipan. In the Swartswood soil, the root zone is somewhat deeper than in the Mardin soil because the depth to the pan is greater. Natural organic matter content is low. The surface layer and upper part of the subsoil in both soils are 15 to 35 percent gravel or channery fragments. In addition, large stones are on the surface. In unlimed areas, the surface layer is extremely acid to strongly acid in the Swartswood soil and extremely acid to slightly acid in the Mardin soil.

Most areas of this map unit are either forested or idle. A few areas are pastured.

These soils are not suitable for cultivated crops because of the large stones on the surface. Unless the stones are removed, operating equipment is extremely difficult and hazardous. Additional limitations to crop production include seasonal wetness, the moderate hazard of erosion, the restricted root zone, restricted available water capacity, and small stones. These limitations should be considered in determining the feasibility of clearing stones for cultivated crops or hay. If areas are cleared, cross-slope tillage, cover crops, minimum tillage, stripcropping, and sod crops in the cropping system are needed to control erosion, preserve tilth, and increase organic matter content.

The soils in this map unit can be used for permanent pasture. Reseeding and applying lime and fertilizer are difficult because of the large surface stones. Proper stocking, rotation grazing, and restricted grazing when the soils are wet early in spring help to maintain desirable pasture grasses.

Suitability for timber production is fair to good. Forested areas commonly support such desirable species as northern red oak, sugar maple, white ash, and black cherry. There is generally no hazard of windthrow, high seedling mortality, or erosion. Hand planting of seedlings is generally needed because of the large stones.

Large stones on the surface, moderately slow to very slow permeability in the fragipan, seasonal wetness, small stones, slope, and droughtiness in some years are limitations for most urban uses. Careful selection of homesites is needed. Some areas are suitable for recreation uses such as picnic areas, campsites, and hiking trails, but site selection is important.

The capability subclass is VIs.

SXD—Swartswood and Mardin very stony soils, moderately steep. This map unit consists of well drained and moderately well drained Swartswood soil and moderately well drained Mardin soil. Some areas are Swartswood soil, others are Mardin soil, and a few include both soils. These deep soils have a fragipan. They formed in glacial till deposits on hillsides and ridges in uplands. The slope is dominantly 15 to 25 percent but ranges from 15 to 35 percent. The surface layer texture, excluding large stones, is gravelly loam, gravelly silt loam, gravelly fine sandy loam, or channery sandy loam. Stones and boulders greater than 10 inches in diameter are about 5 to 30 feet apart on the surface. Areas are long and narrow or oval and mostly 15 to 150 acres.

Typically the Swartswood soil has a 2-inch surface layer of very dark grayish brown gravelly loam. The subsoil is 55 inches thick. The upper part is strong brown gravelly loam over mottled yellowish brown gravelly fine sandy loam. From 28 to 57 inches is a brown gravelly fine sandy loam, firm and brittle fragipan. The substratum to 70 inches is brown gravelly fine sandy loam.

Typically the Mardin soil has a 6-inch surface layer of dark brown gravelly silt loam. The upper 5 inches of subsoil is yellowish brown gravelly silt loam. Under this is a thin leached layer of mottled pale brown gravelly silt loam. From 15 to 60 inches is a firm, olive brown channery silt loam fragipan.

Included with these soils in mapping are a few small areas that are free of large surface stones. Also included on a few foot slopes are the moderately well drained to somewhat poorly drained Wurtsboro soils or somewhat poorly drained Erie soils, a few spots that are severely eroded, and some areas where large stones are less than 5 feet apart on the surface.

In both Swartswood and Mardin soils the water table is perched above the fragipan early in spring. Permeability is moderate above the pan in both soils. It is slow or moderately slow in the pan and substratum in the Swartswood soil and is slow or very slow in the Mardin soil. Available water capacity is low to moderate, and runoff is rapid in both soils. Roots are restricted by the dense pan. In the Swartswood soil the root zone is somewhat deeper than in the Mardin soil because the depth to the pan is greater. Natural organic matter content is low. The surface layer and upper part of the subsoil in both soils are 15 to 35 percent gravel or channery fragments. In addition, large stones are on the surface. In unlimed areas, the surface layer is extremely acid to strongly acid in Swartswood soils and is extremely acid to slightly acid in Mardin soils.

Most areas of this map unit are either forested or idle.

These soils are not suitable for cultivated crops or hay because of the slope and the large stones on the surface. Because of the moderately steep slopes, operating equipment is somewhat difficult even if the stones are removed. Additional limitations include seasonal wetness, the serious hazard of erosion, the restricted root zone, restricted available water capacity, and small stones. These limitations should be considered in determining the feasibility of clearing stones for limited crop or hay production. If areas are cleared, cultivated crops should be grown infrequently and under maximum conservation measures.

The soils in this map unit have limited use for permanent pasture. Reseeding and applying lime and fertilizer are extremely difficult because of the large surface stones and the slope. Proper stocking, rotation grazing, and restricted grazing when the soils are wet early in spring are needed to maintain desirable pasture grasses.

Suitability for timber production is fair to good. Forested areas commonly support such trees as northern red oak, sugar maple, white ash, and black cherry. Logging trails should be laid out across the slope to prevent trail erosion and gullying.

These soils are generally not suitable for urban uses because of the slope and the large stones on the surface. Moderately slow to very slow permeability in the pan, seasonal wetness, small stones, slope, and droughtiness in some years are additional limitations. Some areas can be used for recreation, such as hiking and horseback riding.

The capability subclass is VIIs.

SXF—Swartswood and Mardin very stony soils, very steep. This map unit consists of well drained and moderately well drained Swartswood soil and moderately well drained Mardin soil. Some areas are Swartswood soil, others are Mardin soil, and a few include both soils. These deep soils have a fragipan. They formed in glacial till deposits on hillsides, valley sides, and mountainsides of uplands. The slope ranges from 35 to 45 percent. The surface layer texture, excluding large stones, is gravelly loam, gravelly silt loam, gravelly fine sandy loam, or channery sandy loam. Stones and boulders greater than 10 inches in diameter are 5 to 30 feet apart on the surface. Areas are long and narrow and mostly 10 to 50 acres.

Typically the Swartswood soil has a 2-inch surface layer of very dark grayish brown gravelly loam. The subsoil is 50 inches thick. The upper part is strong brown gravelly loam over mottled yellowish brown gravelly fine sandy loam. From 26 to 52 inches is a brown gravelly fine sandy loam, firm and brittle fragipan. The substratum to 70 inches is brown gravelly fine sandy loam.

Typically the Mardin soil has a 5-inch surface layer of dark brown gravelly silt loam. The upper 5 inches of subsoil is yellowish brown gravelly silt loam. Under this is a thin leached layer of mottled pale brown gravelly silt loam. From 14 to 60 inches is a firm, olive brown channery silt loam fragipan.

Included with these soils in mapping are a few small areas that are free of large surface stones. Also included are the moderately well drained to somewhat poorly drained Wurtsboro soils or somewhat poorly drained Erie soils on a few foot slopes, some severely eroded areas, and a few extremely stony areas.

In both Swartswood and Mardin soils a seasonal high water table moves laterally across the top of the fragipan early in spring. Permeability is moderate above the pan in both soils. It is slow or moderately slow in the pan and substratum in Swartswood soil and is slow or very slow in the Mardin soil. Available water capacity is low to moderate, and runoff is rapid to very rapid in both soils. Roots are restricted by the dense pan. In the Swartswood soil the root zone is somewhat deeper than in the Mardin soil because the depth to the pan is greater. Natural organic matter content is low. The surface layer and upper part of the subsoil in both soils are 15 to 35 percent gravel or channery fragments. In addition large stones are on the surface. In unlimed areas, the surface layer is extremely acid to strongly acid in Swartswood soils and is extremely acid to slightly acid in Mardin soils.

Most areas are forested.

These soils are not suitable for crop production because of the large stones on the surface and the very steep slopes. Even if stones are removed, equipment cannot be operated safely on the very steep slopes. Erosion is a very serious hazard if the plant cover is removed. Permanent vegetation should be maintained.

Pasture on these soils is generally of poor quality. Large stones on the surface and the slope prevent reseeding and applying lime and fertilizer. Overgrazing leads to erosion. Restricted or limited grazing is needed to maintain a thick plant cover.

Suitability for timber production is fair to poor. Forested areas commonly are northern red oak, sugar maple, white ash, and black cherry. The use of equipment is seriously limited because of slope.

The soils in this map unit are not suited to urban uses or most recreation uses because of very steep slopes and large surface stones. Most areas are best left in natural plant cover as habitat for wildlife.

The capability subclass is VIIs.

Tg—Tioga silt loam. This deep, well drained, nearly level soil formed in silty alluvial deposits on flood plains and low terraces. It is in valleys along streams and rivers that are subject to periodic overflow. The slope ranges from 0 to 3 percent. Areas are oval and mostly 5 to 15 acres.

Typically the surface layer is very dark grayish brown silt loam 3 inches thick. The subsoil is dark brown silt loam 22 inches thick. The upper part of the substratum is mottled dark yellowish brown silt loam, and the lower part to a depth of 60 inches is mottled dark brown fine sandy loam.

Included with this soil in mapping are a few slightly lower areas of the moderately well drained to somewhat poorly drained Middlebury soils. Small pockets of the poorly drained and very poorly drained Wayland soils are identified by spot symbols on the soil map. Also included are a few areas where the surface layer and subsoil are very gravelly and a few small areas of excessively drained Suncook soils.

This Tioga soil is subject to flooding in spring in some years. The water table, which is somewhat controlled by the water level in the adjacent stream, rises into the upper part of the substratum in spring. Permeability is moderate or moderately rapid in the surface layer and subsoil and is moderate to rapid in the substratum. Available water capacity is moderate to high. Runoff is slow. Roots are not restricted, and some penetrate well into the substratum as the water table drops late in spring. Natural organic matter content is medium to high. The surface layer is 0 to 2 percent gravel fragments. It is strongly acid to neutral.

Most areas of this soil are farmed. Only a few inaccessible areas are idle or forested.

This soil is well suited to cultivated crops, small grain, and hay. In some areas it is suited to vegetable crops. It is easily tilled at the proper moisture content. In some years tillage is delayed by spring flooding, which can cause surface scour, streambank erosion, and deposition of debris in low areas. Cover crops, return of crop residue, minimum tillage, and protection of streambanks reduce the hazard of scour and streambank erosion and insure good tilth, which allows intensive cultivation. Flooding is generally not a problem during the growing season.

This soil is suited to pasture. Proper stocking, rotation grazing, and restricted grazing when the soil is wet early in spring are needed to maintain pasture seedings.

Suitability for timber production is good. Wooded areas support such species as sugar maple and northern red oak. There is no hazard of erosion, seedling mortality, or windthrow and no limitation on the use of equipment.

This soil is not suited to most urban uses because of the flood hazard. Some areas are suitable for summer campsites, picnic areas, and athletic fields. Many areas are good sources of topsoil.

The capability class is I.

UF—Udifluvents-Fluvaquents complex, frequently flooded. This soil complex is commonly termed alluvial land. It consists of deep, well drained to very poorly drained, nearly level to gently sloping soils that formed in recent alluvial deposits. It is subject to frequent flooding, which results in stream scour, lateral erosion, and shifting of soil deposits from one place to another. The slope ranges from 0 to 5 percent but is mainly less than 3 percent. Areas are mostly long and narrow and adjacent to secondary streams. A few are wider and are along larger streams and rivers. Areas are commonly 5 to 20 acres in size.

The soils in this complex have little or no profile development. The complex is about 45 percent Udifluvents, 45 percent Fluvaquents, and 10 percent other soils. Soil characteristics, including texture, gravel content, and drainage, are so variable within short distances that mapping individual soil series was not practical.

Typically Udifluvents have a brownish or grayish surface layer that ranges from very gravelly fine sand to

silty clay loam and is 1 to 5 inches thick. The substratum to a depth of 60 inches or more is brown, olive brown, or reddish brown and ranges in texture from sand to silty clay. In places it contains gravel and stone fragments.

Typically Fluvaquents have a dark brown or dark gray surface layer that ranges from very gravelly fine sand to silty clay and is 1 to 6 inches thick. The substratum to a depth of 60 inches or more is mottled gray or dark brown and ranges from sand to silty clay. In places it contains gravel and stones.

Included with this soil complex in mapping are a few small areas of the well drained Tioga soils, moderately well drained to somewhat poorly drained Middlebury and Basher soils, and poorly drained to very poorly drained Wayland soils on flood plains.

Most areas of this complex are idle and support native grasses, brush, and a few trees, such as willow, alder, soft maple, and hemlock.

Suitability for farm and urban uses is poor. Some areas can be used for pasture. Reseeding, applying lime and fertilizer, and other management practices are difficult because areas are generally inaccessible, meandering, or dissected by old stream channels. Soil features important to use and management, such as available water capacity, texture, small stone content, surface topography, permeability, depth to seasonal high water table, and soil reaction are highly variable within short distances. The hazard of frequent flooding and the variability of soil characteristics seriously limit the use of this soil complex. Some areas provide sites for ponds or the development of wildlife marshes. Onsite investigation is essential for any intended use.

The capability subclass is Vw.

UH—Udorthents, smoothed. These soils formed in manmade cut and fill areas, which are generally near industrial sites, urban developments, or other construction sites. They consist of excavated earthy material that has been stockpiled for eventual use as fill or topdressing; soil and rock material that has been trucked from other areas and leveled; or soil left in areas that have been excavated or cut. The unit is dominantly nearly level to sloping. Some areas are steeper, particularly at the edge of cuts and along the sides of mounded fill. Areas are variable in shape and are commonly 3 to 15 acres.

Typically the surface layer is brown or grayish brown very gravelly loamy sand to silty clay loam and 1 to 8 inches thick. The substratum is commonly light olive brown, brown, or dark yellowish brown and varies in texture from very gravelly loamy fine sand to silty clay.

These soils are excessively drained to moderately well drained. Texture, stone content, soil pH, and depth to bedrock vary considerably from one area to another. Bedrock, however, is generally at depths greater than 5 feet. The depth to the seasonal high water table and the permeability vary considerably, depending on topography, degree of compaction, soil texture, and other related factors.

Most areas are idle and commonly support scattered weeds and grasses. A few areas have reverted to brush and tree saplings.

These cut and fill areas generally are poorly suited to farming or recreation. Onsite investigation is needed to determine feasibility for any purpose.

No capability subclass is assigned.

UnB—Unadilla silt loam, 0 to 8 percent slopes. This deep, well drained, nearly level to gently sloping soil formed in glacial lake-laid deposits high in content of coarse silt and very fine sand. It is on terraces and undulating benches on plains, in valleys, and in a few upland areas. Areas are oval or round and mostly 5 to 20 acres.

Typically the surface layer is brown silt loam 8 inches thick. The subsoil is 36 inches thick. It is yellowish brown silt loam over light olive brown very fine sandy loam. The substratum to a depth of 60 inches is loose, dark grayish brown stratified very gravelly sand.

Included with this soil in mapping are areas of the moderately well drained Scio soils and pockets of the somewhat poorly drained to poorly drained Raynham soils in slightly lower areas. Also included are a few small areas where the subsoil is silty clay loam and some areas where the surface layer is gravelly.

Depth to the water table in this Unadilla soil is usually more than 6 feet. Permeability is moderate in the surface layer and subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Runoff is slow to medium. Roots are not restricted, and some extend into the substratum. Natural organic matter content is low. The surface layer and subsoil are generally gravel free. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this soil are used intensively for farming or urban development.

This soil is well suited to cultivated crops, small grain, and hay. In some areas it is suited to vegetable crops. This gravel-free soil is easy to till and is well suited to minimum tillage. It can be cultivated intensively if well managed. Erosion is the principal concern, particularly where slopes are long and gently sloping or where the surface has been left bare of plant cover. A few random subsurface drains to the included wet spots improve some fields. Cross-slope tillage, cover crops, return of crop residue, and tillage at the proper moisture content help to control erosion and preserve soil tilth.

This soil is well suited to pasture. Proper stocking, rotation grazing, restricted grazing when the soil is wet early in spring, and lime and fertilizer are needed to maintain good pasture seedings.

Suitability for timber production is good. The few forested areas support such species as sugar maple, black cherry, and northern red oak. There are few problems or restrictions related to equipment use, erosion, windthrow, or seedling mortality.

This soil is well suited to most urban and recreation uses. Most areas provide good sites for dwellings. Frost

action limits some uses. Some areas are good sources of topsoil. Some are good sites for athletic fields.

The capability subclass is IIe.

UnC—Unadilla silt loam, 8 to 15 percent slopes. This deep, well drained, sloping soil formed in glacial lake-laid deposits that are high in content of coarse silt and very fine sand. It is on terrace fronts, ridges, and low hills on plains, in valleys, and in a few upland areas. Areas are oval or long and narrow and are mostly 5 to 20 acres.

Typically the surface layer is brown silt loam 8 inches thick. The subsoil is 32 inches thick. The upper part is yellowish brown silt loam. The lower part is light olive brown very fine sandy loam. The substratum to a depth of 60 inches is loose, dark grayish brown stratified very gravelly sand.

Included with this soil in mapping are the moderately well drained Scio soils in slightly lower areas. Also included are a few small areas where the subsoil is silty clay, some areas where the surface layer is gravelly, and a few areas that are severely eroded.

Depth to the water table in this Unadilla soil is usually more than 6 feet. Permeability is moderate in the surface layer and subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Runoff is medium to rapid. Roots are not restricted, and some extend into the substratum. Natural organic matter content is low. The surface layer and subsoil are generally gravel free. In unlimed areas, the surface layer is very strongly acid to medium acid.

Most areas of this soil are used intensively for farming or urban development. Some are wooded.

This soil is suited to cultivated crops, small grain, and hay. Erosion is a very serious hazard, particularly on long slopes or in areas where the surface has been left bare of plant cover. This gravel-free soil is easy to till and is well suited to minimum tillage. Cross-slope tillage, cover crops, return of crop residue, stripcropping, diversion terraces, and sod crops in the cropping system are needed to reduce the hazard of erosion, preserve tilth, and increase organic matter content.

This soil is well suited to pasture. Proper stocking, rotation grazing, restricted grazing when the soil is wet early in spring, and lime and fertilizer are needed to maintain good pasture seedings.

Suitability for timber production is good. The few forested areas support such species as sugar maple, black cherry, and northern red oak. There are few problems or restrictions related to equipment use, windthrow, or seedling mortality. Logging trails laid out across the slope reduce the hazard of trail erosion and gullying.

This soil is suited to many urban and recreation uses. Slope and frost action are limitations for some uses. Some areas provide good homesites, but careful site selection is needed. Erosion is a hazard during construction.

The capability subclass is IIIe.

Ur—Urban land. This map unit consists of areas where at least 80 percent of the surface is covered with asphalt, concrete, other impervious materials, or buildings. These areas are mostly parking lots, shopping centers, industrial parks, and business centers in villages and cities. Most were graded or filled before being covered with nonsoil material or buildings. Most areas are nearly level or gently sloping; only a few are steep. Areas are mainly rectangular or square and range from 3 to 100 acres.

Included with this unit in mapping are a few small areas where the original soil is undisturbed or is not covered with nonearthy material.

In most areas rapid or very rapid runoff creates problems in discharging water to safe outlets. A few areas are in low spots where the seasonal high water table causes ponding on the asphalt or concrete surface. Depending on the underlying soil deposits, frost action is a common problem that results in cracking, heaving, and breakup of the nonsoil surface.

This unit is not suitable for farm, residential, or woodland uses. Careful onsite investigation is needed to determine the stability of areas for large multistoried structures. Onsite septic effluent disposal systems are generally not feasible in these areas.

No capability class is assigned.

Wa—Wallkill silt loam. This deep, very poorly drained, nearly level soil formed in silty alluvial deposits over well-decomposed organic deposits. It is on low flood plains along streams that overflow periodically and is at the margins of muckland. The slope is no more than 3 percent and is mostly less than 1 percent. Areas are long and narrow or oval and are 5 to 20 acres.

Typically the surface layer is very dark gray silt loam 9 inches thick. The subsoil is mottled grayish brown silt loam 9 inches thick. The substratum to a depth of 60 inches is black organic muck.

Included with this soil in mapping are a few areas of very poorly drained Wayland soils that are similar but do not overlie organic deposits. Also included are a few small areas of Palms muck and a few spots where the silty alluvial mantle is less than 16 inches thick over organic deposits.

In most years, commonly in spring, this Wallkill soil is subject to flooding. The water table is at or near the surface for prolonged periods during the year unless the soil is drained. Permeability is moderate in the surface layer and subsoil and is moderately rapid or rapid in the organic substratum. Available water capacity is high and runoff is very slow. Roots are restricted to the surface layer and the upper part of the subsoil by the prolonged high water table. Natural organic matter content is high. The soil is generally gravel free. The surface layer is strongly acid to neutral.

Some areas of this soil are idle and support wet-tolerant vegetation. Many drained areas are farmed.

Unless drained, this soil is not suited to crop production. If adequately drained it can be highly productive of

cultivated crops and special vegetable crops. Drainage outlets are often difficult to locate because of the low position in the landscape. If outlets can be established, a combination of open ditches and subsurface drains is effective in providing adequate drainage. If adequately drained, this nearly level, gravel-free soil is easy to till. Cover crops, minimum tillage, sod crops in the cropping system, return of crop residue to the soil, and plowing at the proper moisture content preserve tilth, prevent flood scour, and maintain a high level of organic matter. Protection from flooding, scour, and associated streambank erosion may be needed in some areas.

This soil is poorly suited to pasture because of prolonged wetness. Grazing during wet periods compacts the soil and tramples desirable grasses. Partial drainage of areas makes them much more useful for pasture.

Suitability for timber production is poor. Wooded areas commonly support such species as pin oak and red maple. Wetness limits the use of equipment. Windthrow is a hazard because of the restricted root zone.

This soil is not suited to urban or most recreation uses because of the flood hazard, prolonged wetness, and low strength of the underlying organic deposits. Some areas are well suited to the development of wetland wildlife marshes.

The capability subclass is IIIw.

Wd—Wayland silt loam. This deep, poorly drained and very poorly drained, nearly level soil formed in silty alluvial deposits. It is on low floodplains adjacent to streams that overflow. The slope is no more than 3 percent. Areas are oval or long and narrow and are mostly 5 to 15 acres.

Typically the surface layer is very dark grayish brown silt loam 9 inches thick. The subsoil is mottled dark gray silt loam 8 inches thick. The substratum is mottled olive gray silt loam to a depth of 35 inches, mottled light olive gray silt loam to 47 inches, and mottled gray fine sandy loam to 60 inches.

Included with this soil in mapping are a few higher spots of the moderately well drained to somewhat poorly drained Middlebury soils. Also included are a few small areas of the very poorly drained Wallkill soils, which are underlain by organic deposits. A few spots where the surface layer is gravelly are identified by spot symbols on the soil map.

This Wayland soil is commonly subject to flooding in spring. The water table is at or near the surface for prolonged periods during the year unless the soil is drained. Permeability is moderately slow or moderate in the surface layer and is slow in the subsoil and substratum. Available water capacity is high. Runoff is very slow. The prolonged high water table restricts roots to the surface layer and the upper part of the subsoil. Natural organic matter content is high. The surface layer and subsoil are generally gravel free. The surface layer is strongly acid to mildly alkaline.

Most areas of this soil are idle. Some are pastured.

This soil is poorly suited to cultivated crops or hay unless drained. Drainage systems are commonly difficult to establish because of the lack of suitable outlets. If outlets are available, drains should be closely spaced because of the slowly permeable subsoil. Drainage of areas that are small, irregular in shape, or inaccessible is not practical. If the soil is drained, minimum tillage, cover crops, sod crops in the cropping system, and tillage at the proper moisture content help to maintain tilth and high organic matter content. Scour, siltation and deposition of debris, and streambank erosion are hazards because of flooding.

This soil is not well suited to pasture unless it is partly drained. Grazing during wet periods compacts the soil and tramples desirable grasses. Proper stocking, rotation grazing, and restricted grazing in wet periods help to maintain pasture seedings.

Suitability for timber production is poor. Forested areas support such species as red maple. Prolonged wetness limits the use of equipment. Windthrow is a hazard because of the shallow root zone.

This soil is not suited to most urban and recreation uses because of flood hazard, prolonged wetness, and slow permeability. Some areas provide good sites for wildlife marshes or ponds.

The capability subclass is Vw.

WuB—Wurtsboro gravelly loam, 3 to 8 percent slopes. This deep, moderately well drained to somewhat poorly drained, gently sloping soil formed in glacial till deposits derived from acid gray and brown quartzite conglomerate and sandstone. It has a fragipan in the subsoil. It is on low ridges, hilltops, and foot slopes in uplands. Areas are mostly long and narrow or round and are commonly 10 to 25 acres.

Typically the surface layer is brown gravelly loam 1 inch thick. The upper 8 inches of the subsoil is strong brown gravelly loam. The lower 11 inches is yellowish brown loam. Next is a 3-inch leached layer of mottled light brownish gray gravelly fine sandy loam. From 23 to 60 inches is a light olive brown gravelly loam fragipan.

Included with this soil in mapping are a few small slightly higher knolls of well drained to moderately well drained Swartswood soils. Areas of the very poorly drained Alden soils in a few small depressions and some areas where the surface is covered with large stones are identified by spot symbols on the soil map.

The water table in this Wurtsboro soil is commonly perched above the fragipan in spring and other excessively wet periods. Permeability is moderate in the surface layer and subsoil above the pan and slow in the pan. Available water capacity is low above the pan. Runoff is slow to medium. Root penetration is good to the top of the fragipan, which is at a depth of 18 to 25 inches; few roots penetrate the dense pan. Natural organic matter content is low. The surface layer is 15 to 25 percent gravel fragments. In unlimed areas, the surface layer is extremely acid to strongly acid.

Most areas of this soil are wooded. Some are pastured, and a few are cultivated.

This soil is moderately suited to cultivated crops, some grain, and hay. Wetness delays tillage in spring and interferes with harvest in fall. Interceptor drains that divert runoff and seepage from higher adjacent soils improve some fields. Erosion is a hazard, particularly on long slopes and in areas left bare of plant cover. Droughtiness can be a problem in some years because of the relatively shallow root zone. Gravel fragments are bothersome for planting and harvesting. Because of these limitations, hay crops are often more suitable than cultivated crops. If cultivated crops are grown, cross-slope tillage, cover crops, sod crops in the cropping system, minimum tillage, and tillage at the proper moisture content are needed to control erosion, preserve tilth, and increase organic matter content, which improves the available water capacity.

Pasture grasses that can withstand seasonal wetness are suited to this soil. Grazing during wet periods compacts the soil and tramples desirable grasses. Proper stocking, rotation grazing, lime and fertilizer, and restricted grazing in wet periods help to maintain pasture seedings.

Suitability for timber production is fair. Forested areas commonly support such species as northern red oak and sugar maple. There is generally no erosion hazard or equipment limitation.

This soil is poorly suited to most urban uses because of seasonal wetness, slow permeability in the fragipan, and small stones. Careful installation of drains around dwelling foundations minimizes seasonal wetness and lateral seepage across the top of the pan. Some areas are suitable for recreation uses such as picnic areas, campsites, and hiking trails. Some areas are suitable as sites for ponds.

The capability subclass is IIw.

WuC—Wurtsboro gravelly loam, 8 to 15 percent slopes. This deep, moderately well drained to somewhat poorly drained, sloping soil formed in glacial till deposits derived from acid gray and brown quartzite conglomerate and sandstone. It has a fragipan in the subsoil. It is on ridges and lower hillsides of uplands. Most areas receive runoff from higher adjacent soils. Areas are mostly long and narrow or oval and are commonly 10 to 25 acres in size.

Typically the surface layer is brown gravelly loam 1 inch thick. The upper 7 inches of the subsoil is strong brown gravelly loam. The lower 10 inches is yellowish brown loam. Next is a 3-inch leached layer of mottled light brownish gray gravelly fine sandy loam. From 21 to 60 inches is a light olive brown gravelly loam fragipan.

Included with this soil in mapping are a few small slightly higher areas of the well drained to moderately well drained Swartswood soils. Some places where the surface layer is covered with large stones are indicated by spot symbols on the soil map.

The water table in this Wurtsboro soil is commonly perched above the fragipan in spring and other excessively wet periods. Permeability is moderate above the fragipan and slow in the pan. Available water capacity is low above the pan. Runoff is medium to rapid. Root penetration is good to the top of the fragipan, which is at a depth of 18 to 25 inches; few roots penetrate the dense pan. Natural organic matter content is low. The surface layer is 15 to 25 percent gravel fragments. In unlimed areas, it is extremely acid to strongly acid.

Most areas of this soil are wooded. A few are pastured or cultivated.

This soil can be used for cultivated crops, but the erosion hazard and seasonal wetness are serious limitations. The hazard of erosion is particularly serious where slopes are long and runoff is received from higher adjacent soils. Seasonal wetness delays tillage in spring. Interceptor drains that divert runoff and seepage from higher adjacent soils improve many areas. Midsummer droughtiness and small stones are additional limitations. Many areas are better suited to hay crops than cultivated crops. If cultivated crops are grown, stripcropping, cross-slope tillage, cover crops, sod crops in the cropping system a large part of the time, diversion ditches, and tillage at the proper moisture content minimize the hazard of erosion, preserve tilth, and improve organic matter content.

Pasture grasses that can withstand seasonal wetness are suited to this soil. Grazing during wet periods compacts the soil and tramples desirable grasses. Proper stocking, rotation grazing, lime and fertilizer, and restricted grazing in wet periods help to maintain pasture seedings.

Suitability for timber production is fair. Forested areas commonly support such species as northern red oak and sugar maple. Logging trails laid out across the slope prevent trail erosion and gullying.

This soil is poorly suited to most urban uses because of seasonal wetness, slow permeability in the fragipan, slope, and small stones. Some areas can be used for recreation, such as campsites and hiking trails.

The capability subclass is IIIe.

Use and management of the soils

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

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

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

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

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

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

Crops and pasture

Malcolm L. Henning, district conservationist, Soil Conservation Service; William Pendergast, extension agent, Cooperative Extension Service; and Robert B. Crawford, conservation agronomist, Soil Conservation Service, helped prepare this section.

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

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

More than 105,000 acres in Orange County was used for crops and pasture in 1974, according to the Census of Agriculture (*13*). Of this total, 37,000 acres was in pasture and 68,000 acres was in crops, mostly hay, corn, and vegetables.

The potential for increased crop production is excellent in certain parts of the county. About 22,000 acres of potentially good cropland is currently pastured, and another 30,000 acres is wooded. In addition to the reserve productive capacity represented by this land, crop yields could be increased by extending the latest technology and appropriate conservation practices to all cropland. This soil survey can facilitate the use of new technology and the application of conservation practices.

The acreage in crops and pasture has decreased rapidly in the last few decades as more and more land is used for urban and recreation purposes. Using the soil survey to help make land use decisions that will influence the future of farming is discussed in the sections "Use and management of the soils" and "Soil maps for detailed planning" and is illustrated in the section "How to use this soil survey".

Principles of management

General principles of soil management related to crop production are defined in the following paragraphs.

Soil erosion is a major hazard on about half the cropland in Orange County, according to the 1967 New York State Inventory of Soil and Water Conservation Needs (*10*). The hazard of erosion is related to the slope of the land, the erodibility of the soil, the amount and intensity of rainfall, and the type of plant cover.

Loss of soil through erosion is damaging for several reasons—loss of nutrients and water, formation of gullies on hillsides, deterioration of tilth, detrimental sedimentation downslope, and pollution of streams and water reservoirs. Soil productivity is reduced when the surface layer is lost and increasing amounts of the subsoil are incorporated into the plow layer, especially in soils that have a fine or moderately fine textured subsoil, such as Rhinebeck, or those that have a compact subsoil that restricts roots, such as Mardin and Wurtsboro. Erosion also reduces productivity on soils that tend to be droughty, for example, on Otisville and Chenango, through the loss of organic matter. Arnot, Nassau, Lordstown, and other soils that are shallow or only moderately deep over bedrock are permanently damaged by erosion.

Erosion control provides protective cover, reduces runoff, and increases water infiltration. Many tillage and conservation practices aid in erosion control. Minimum tillage, no-till farming, cover crops, crop residue on the surface, and a cropping system that has a high proportion of sod crops are effective on soils with short irregular slopes, such as Hoosic, Riverhead, and Bath-Nassau soils. Contour tillage, stripcropping, terraces, and diversions are more suitable on soils with smooth, long uniform slopes, such as the sloping Mardin and Swartswood soils.

Control of water erosion is generally needed if the slope is more than 3 percent. Allard, Unadilla, and Collamer soils, all of which are high in silt content and do not contain coarse fragments, are the most susceptible to erosion.

Soil blowing is a hazard on soils such as the sandy Oakville soils and on cleared and drained areas of the organic Carlisle and Palms muck. Blowing is a particular hazard if the surface is dry. Windbreaks, regulation of the water table, and irrigation are effective in reducing the risk of wind erosion.

The effectiveness of a particular combination of conservation practices differs on different soils. Moreover,

different combinations can be equally effective on the same soil. The local representative of the Soil Conservation District can assist in planning an effective combination of practices to reduce the risk of erosion.

Soil drainage is a major need on about one-third the acreage considered potential cropland in the survey area. Some soils are so wet that the production of crops commonly grown in the area is generally not possible without extensive drainage. Examples are the poorly drained and very poorly drained Alden, Canandaigua, Carlisle, Halsey, Madalin, Palms, Scarboro, Wallkill, and Wayland soils.

Seasonal wetness interferes with early planting, growth, and harvesting of most crops on the somewhat poorly drained soils, such as Erie, Fredon, Raynham, and Rhinebeck soils. Crops on these soils respond well to improved drainage. Yields on drained soils are often as high as on naturally well drained soils.

Some well drained and moderately well drained soils, such as Allard, Bath, Swartswood, Riverhead, and Mardin, contain small areas of wetter soils that require random subsurface drains to make management more uniform.

Some wet sloping soils, such as Wurstboro and Erie, can be improved by interceptor drains that divert surface runoff and subsurface seepage.

The design of a drainage system varies with the kind of soil. A combination of surface and subsurface drainage is needed in most poorly drained and very poorly drained soils. Surface drainage can include open ditches, grassed waterways, land smoothing, and bedding. A subsurface drain is mainly tile or plastic. Establishing drainage outlets is often difficult and expensive because of the low position of these soils in the landscape.

Drains must be more closely spaced in slowly permeable soils than in more permeable soils. Subsurface drainage is slow in such soils as Erie, Madalin, and Rhinebeck. These soils may also require surface drainage. Rapidly permeable soils, such as Fredon, Halsey, and Scarboro, respond well to subsurface drainage if adequate outlets are available.

Information on drainage systems and cost is available at the Orange County Soil and Water Conservation District Office.

Surface stones, boulders, and outcrops of rock severely limit soil use for cropland and pasture in many areas, particularly in the southeastern and southwestern parts of the county. They interfere with the use of equipment. Some very stony and very bouldery soils, for example, the very stony Swartswood and Mardin soils, can be used only as permanent pasture. Even then, fertilizing, reseeding, and mowing are difficult. The extremely stony Erie soils are even more difficult to manage for pasture. Areas of the Rock outcrop-soil complexes, such as Rock outcrop-Arnot or Rock outcrop-Hollis, where more than 20 percent of the surface area is outcrop, are not suited to cultivation. Use is largely limited to permanent pasture, orchards maintained in permanent sod, woodland, or wildlife habitat.

Removing the larger stones and boulders from some soils that have few other limiting properties may be feasible. Overcoming limitations in areas where rock crops out, however, is usually not feasible.

Available water capacity is an important consideration in growing crops. Some soils in the county tend to be droughty. Sandy and gravelly soils, soils that have a restricting layer such as a fragipan, and soils that are shallow or moderately deep over bedrock tend to have a fairly low capacity for storing moisture. The gravelly Hoosic soils, the sandy Oakville soils, the Erie soils, which have a fragipan, and the shallow Hollis soils have low available water capacity. Maintaining or increasing the level of organic matter and improving soil structure increase the available water capacity of these droughty soils. Green manure crops, crop residue, and manure build up the level of organic matter and improve structure.

Soil tilth is an important factor in the emergence of seedlings, the infiltration of water, and the ease of cultivation. Soils in good tilth usually have granular structure and are porous.

Tilth depends on the kind of tillage. Excessive tillage tends to reduce organic matter content and breaks down soil structure. Some soils that are deep, well drained or excessively drained, and coarse textured or moderately coarse textured—Otisville and Hoosic soils, for example—can be tilled with little or no concern that tilth will be damaged. Wetter and finer textured soils, however, such as Rhinebeck and Madalin, must be tilled at the proper moisture content to prevent deterioration of the natural structure. Plowing or cultivating when these soils are wet causes puddling and results in a hard surface crust and clods when they dry.

Cultivation at the proper moisture content; sod crops, green manure crops, and cover crops in the crop rotation; and return of crop residue and additions of manure help to keep the soil granular and porous.

Soil fertility. All soils in the county need lime and/or fertilizer for optimum crop production. The amount needed depends on the natural content of lime and plant nutrients, on the needs of the particular crop, and on the level of yield desired.

Organic matter content is important in assessing fertility. It averages about 3.5 percent in the surface layer of the soils in Orange County. Poorly drained and very poorly drained soils, such as Madalin and Alden, have a somewhat higher organic matter content.

Nitrogen is released from the organic matter, but much of it is in complex forms that cannot be used by plants until it is decomposed by micro-organisms. Nitrogen fertilizer is needed to supplement the nitrogen made available from the soil organic matter. Management that builds up the supply of organic matter, such as green manure crops, sod crops, and return of crop residue, improves the natural nitrogen content.

Timeliness of nitrogen fertilization is important for maximum utilization by plants. Nitrogen can be lost

through leaching in rapidly permeable soils, such as Hoosic, or by denitrification in wetter and less permeable soils, such as Rhinebeck. Best results are obtained when small amounts of nitrogen are applied at timely intervals, for example, at planting and then as a side dressing while the crop is growing.

Orange County soils are generally low in natural phosphorus. Coarse textured soils, such as Otisville and Oakville, tend to be very low in phosphorus. The addition of appropriate amounts of phosphate in the form of commercial fertilizer is essential for good growth.

Most of the soils are low to medium in available potassium. Soils such as Rhinebeck and Madalin, however, which have a clayey subsoil, are somewhat higher in potassium content. Even soils that have a fairly high content of potassium require additional potassium for optimum yields of most crops.

Lime is needed in most of the soils in the survey area to raise the pH to an acceptable level for optimum yields of most crops.

Additions of lime and fertilizer should be based on the results of soil tests. For assistance in obtaining soil tests and recommendations, farmers and others should consult their local cooperative extension agent. New research findings and fertilizer recommendations are available in current editions of "Cornell Recommends for Field Crops" and "Vegetable Production Recommendations" both of which were prepared by the staff of the New York State College of Agriculture, Cornell University, Ithaca, New York. In the absence of soil tests, these references along with this publication can be used as a guide in determining lime and fertility needs.

Special crops, including vegetable and fruit crops, in addition to the crops listed in table 6, are an important part of the agriculture in Orange County.

Vegetables, mainly onions, lettuce, and celery, are grown commercially on drained organic soils, including Carlisle and Palms muck, in the Wallkill River area in the southern part of the county. This area, locally known as the "black dirt" area, covers about 10,000 acres. The value of these crops per acre is exceptionally high.

Orchard crops are grown on various kinds of soil, mostly in the vicinity of the Hudson River where climatic factors are favorable. Apples is the principal orchard crop of commercial importance. There is also a small acreage of grapes, pears, and peaches. About 3,000 acres of fruit crops is harvested each year in Orange County.

The most recent information and suggestions for growing orchard and vegetable crops and the estimated potential yields of these crops can be obtained from the local offices of the Cooperative Extension Service and the Soil Conservation Service.

Soil productivity index

Table 5 rates the arable soils in Orange County according to their potential for sustained high levels of crop production. The soils that are not suited to crops are not listed. The highest index values are assigned to the most productive soils; 100 represents the best potential.

The index indicates the value of a soil on a typical New York State dairy farm, where the major crops are corn silage and hay. It is assumed that the best management is followed, including erosion control, such as contour stripcropping, where needed. Other management to be considered is use of the best varieties; addition of optimum amounts of fertilizer and lime; control of weeds, insects, and diseases; adequate drainage; maintenance of tilth; and timely fieldwork.

The index indicates the relative yields of corn silage and hay according to the total digestible nutrients (TDN) in tons per acre per year. The method used in calculating this index is described in Cornell Agronomy Mimeo 78-16 (*4*).

The yield figures used to calculate the index were taken from the "Yields per acre of crops and pasture" section in this publication. The productivity rating for a particular map unit cannot be directly compared to yield data given in table 6. The yield data indicate soil potential during a single growing season. The productivity index gives the potential for an entire intensive crop rotation period.

It should be noted that the productivity index is for an individual map unit. Not considered is the size of the unit and its interaction with neighboring map units. Most farm fields consist of more than one map unit.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

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

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Woodland management and productivity

Meredith A. Peters, woodland conservationist, Soil Conservation Service, helped prepare this section.

Approximately 238,300 acres, or 45 percent of Orange County, is classified as commercial forest (*11*). The extent of commercial forest types is as follows: white or red pine, 26,900 acres; plantations, 6,000 acres; oak-pine, 11,000 acres; oak, 75,400 acres; elm-ash-red maple, 66,600 acres; maple-beech-birch, 49,200 acres; aspen-birch, 3,200 acres.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *s*, sandy texture; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, d, s, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the

equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe,* that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife habitat

Robert E. Myers, wildlife biologist, Soil Conservation Service helped prepare this section.

Wildlife is an important resource in Orange County. There are three generally different wildlife areas. The central part of the county is dominantly open agricultural land. Populations of ringnecked pheasants, cottontail, and gray squirrels are high. Populations of bobwhite quail and white-tailed deer are low. Along the eastern and southern borders there are more forests and idle lands, both of which have a high population of rabbits and a medium population of deer and grouse. The heavily forested western part of the county has a medium population of deer and rabbits, a low population of snowshoe hare and a few black bear. Songbirds are common throughout the county.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

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

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

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

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

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

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

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

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas

include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

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

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site

features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

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

Sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground

water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill, sand, gravel, and topsoil. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering properties and classifications provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 13 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 15.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to

40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

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

Water management

Table 14 gives information on the soil properties and site features that affect water management. The kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

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

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

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

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

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil properties

Edward A. Fernau, senior soil engineer, New York State Department of Transportation, Soil Mechanics Bureau, helped prepare this section.

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey

area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering properties and classifications

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The

estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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

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

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

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

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

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

Engineering index test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and morphology." The soil samples were tested by the New York State Department of Transportation, Soil Mechanics Bureau.

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

The tests and methods are: AASHTO classification (M 145 49); Unified classification (D 2487 66T); Mechanical analysis (T 88 57); Liquid limit (T 89 60); Plasticity index (T 90 56); Moisture density, Method C (T 99 57); Shrinkage (D 427).

Engineering properties of geologic deposits

This section describes the engineering characteristics of the various unconsolidated geologic deposits in Orange County and their relation to soils. This information should be helpful to planners, designers, engineers, contractors, and others associated with construction projects involving earthy materials. It should be noted that terms used in soil engineering do not always mean the same as similar soil science terms.

The following geologic deposits occur in Orange County: till, outwash, ice-contact, lacustrine, alluvial, and organic. The engineering significance of each deposit is greatly influenced by its mode of deposition, which determines the texture and internal structure of the deposit. Position in the landscape and the position of the water table are also important.

The geologic deposits in Orange County are divided into the following categories: deep till deposits, shallow-to-rock deposits, stratified coarse-grained deposits, stratified fine-grained deposits, and organic deposits.

Deep till deposits are unstratified, highly variable mixtures of particle sizes ranging from rock fragments to clay. This material was scoured and transported from nearby sources by glacial ice and was deposited as ground and recessional moraine. Depth to bedrock is typically more than 5 feet, but in some small areas it

may be less. In a few areas Rock outcrop occurs. The individual rock and mineral fragments in the soil generally reflect the kind of bedrock in the immediate area. Alden, Bath, Charlton, Erie, Mardin, Paxton, Pittsfield, Swartswood, and Wurtsboro soils formed in deep till deposits. Deep till deposits are the most compact of the unconsolidated deposits in the county. Most of the till was subjected to the weight of overriding ice.

Deep till deposits range from nearly level to very steep but are dominantly gently sloping to sloping. On many landscapes, cut and fill earthwork is involved in most construction.

These deposits generally provide stable, relatively incompressible foundations for engineering works. If well compacted, fill material from these deposits generally provides stable embankments. Steeper cut slopes commonly are subject to surface sloughing and erosion.

Shallow-to-rock deposits are glacial till 2 to 5 feet thick over bedrock. Bedrock commonly crops out in most areas. The landforms and topography are generally controlled by bedrock.

The Arnot and Lordstown soils formed over sandstone. Farmington soils formed over limestone. Nassau soils formed over shale or slate. Hollis soils formed over crystalline bedrock. The bedrock in Orange County is described under "Physiography and geology."

Shallow-to-rock deposits formed of glacial till generally have adequate strength for embankments and structures. The main engineering concerns may relate to the condition of the bedrock. The topography generally is such that cut and fill earthwork is needed for extensive engineering works. In general the shale and slate bedrock is more deeply weathered than the sandstone, limestone, and crystalline bedrock. Fill material is severely limited because of the thin mantle of soil material over the rock.

Stratified coarse-grained deposits consist of material, dominantly gravel and sand, that has been sorted by glacial melt water into layered or stratified deposits. It occupies such geologic landforms as outwash plains and terraces; ice-contact kames, eskers and kame deltas; and the coarser textured parts of deltas. Also included are coarse textured alluvial soils on flood plains and low terraces. Strata within these deposits may be well sorted or poorly sorted and may be of particle sizes ranging from cobbles to silt. These deposits are generally loose and porous.

Allard, Castile, Chenango, Fredon, Halsey, Hoosic, Oakville, Otisville, Riverhead, and Scarboro soils formed in gravelly outwash, ice-contact deposits, and deltas. Barbour and Suncook soils formed in alluvium over sand and gravel.

Coarse-grained deposits generally have fairly high strength. Because of their loose and porous nature, most of these deposits are not highly erodible but are subject to settlement if vibrated. Barbour and Suncook soils are subject to flooding.

These deposits of gravel and sand have many uses as construction material. Depending on gradation, soundness, and plasticity, they may be used for such purposes as—

1. Fill material for highway embankments.
2. Fill material for parking areas and developments.
3. Fill material to decrease stress on underlying soils during construction.
4. Subbase for pavements.
5. Wearing surfaces for driveways, parking lots, and some roads.
6. Material for highway shoulders.
7. Free-draining backfill for structures and pipes.
8. Outside shells of dams for impounding water.
9. Slope protection blankets for draining and stabilizing wet cut slopes.
10. Sources of sand and gravel for general use.

Stratified fine-grained deposits consist of fine-grained sediment transported by glacial meltwater and deposited in quiet preglacial lakes and ponds. Some are more recent flood plain soils that formed in slack water deposits. Distinct layers or laminations dominantly of fine sand, silt, and clay-sized particles commonly occur. Although these deposits are mostly silt, they generally include enough clay to make them plastic and sticky.

Madalin and Rhinebeck soils formed in deep lake-laid silt and clay deposits. Canandaigua, Collamer, and Raynham soils formed in deep silty areas of deltas. Scio and Unadilla soils are on alluvial terraces. Middlebury, Udifluvents-Fluvaquents complex, frequently flooded, and Wayland soils formed on flood plains.

Because of fine texture and high moisture content, these deposits have low strength. They are generally highly compressible, and settlement may occur over long periods. Soils having a high silt content are less compressible but are highly erodible and frost susceptible. Soils on flood plains are subject to flooding.

Fine-grained deposits are difficult to use in engineering works, especially where they are flat, wet, and subject to ponding. Sites for embankments and heavy structures or buildings on all soils formed in this finer sediment must be investigated for strength and settlement characteristics and effects of ground water.

Organic deposits are for the most part an accumulation of plant remains. In places they include a minimal amount of mineral soil. They occur in very poorly drained depressions and bogs that are covered with water during part of the year.

Carlisle and Palms soils are deep organic soils. Histic Humaquepts, ponded, are inundated. Wallkill soils have a thin mantle of mineral soil over the organic matter.

Soils formed in organic deposits are entirely unsuitable for foundations because they are wet, weak, and highly compressible. Generally the organic material should be removed as far down as the suitable underlying material and replaced with suitable backfill. Filling over organic deposits results in long term settlement.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*12*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Inceptisol.

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

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

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-silty, mixed, nonacid, mesic Aeric Haplaquepts.

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

Soil series and morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*9*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*12*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

Alden series

The Alden series consists of deep, very poorly drained, nearly level soils. These soils formed in glacial till deposits capped or mixed with local colluvial sediment. They are in upland depressions.

Alden soils formed in the same kind of parent material as the nearby moderately well drained Mardin soils and somewhat poorly drained Erie soils. In contrast with those soils, however, they do not have a fragipan. Alden soils are also near the better drained Arnot and Nassau soils but are deeper over bedrock than those shallow soils.

Typical pedon of Alden silt loam in an idle field in the town of Hamptonburgh, 25 feet south of Sarah Wells Trail and 50 feet south of the intersection of Day Road and Sarah Wells Trail:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; many roots; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—9 to 19 inches; dark gray (10YR 4/1) heavy silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few roots; 10 percent coarse fragments; neutral; clear wavy boundary.

B22g—19 to 28 inches; greenish gray (5GY 6/1) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; 10 percent coarse fragments; neutral; clear wavy boundary.

B3—28 to 36 inches; dark grayish brown (2.5Y 4/2) loam; common medium distinct gray (10YR 5/1) mottles and common medium distinct yellowish brown (10YR 5/6) mottles; very weak medium subangular blocky structure; friable; 5 percent coarse fragments; neutral; clear wavy boundary.
C—36 to 60 inches; olive brown (2.5Y 4/4) gravelly fine sandy loam; common medium distinct gray (10YR 5/1) mottles and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; 20 percent coarse fragments; mildly alkaline.

Solum thickness ranges from 20 to 40 inches. Depth to carbonates is more than 40 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 15 percent in the solum and from 5 to 35 percent in the substratum.

The A horizon is neutral or has hue of 10YR, value of 2 or 3, and chroma of 0 to 2. Texture is very fine sandy loam, silt loam, or loam. Reaction is slightly acid to neutral.

The B horizon is neutral or has hue of 10YR or 5GY, value of 4 to 6, and chroma of 0 to 2. Mottles are both high and low chroma. Texture is heavy silt loam, loam, silty clay loam, or very fine sandy loam. Reaction is slightly acid to neutral.

The C horizon is neutral or has hue of 10YR to 5Y, value of 4 or 5, and chroma of 0 to 4. Mottles, if any, can be either high or low chroma. Texture is fine sandy loam, loam, silt loam, or silty clay loam, or the gravelly analogs. Reaction is neutral to moderately alkaline.

Allard series

The Allard series consists of deep, well drained, nearly level to gently sloping soils on glaciofluvial terraces. These soils formed in old alluvial deposits underlain by outwash sand or gravel.

Allard soils commonly occupy areas near the similar Collamer and Unadilla soils. They are shallower over sand or sand and gravel than those soils. Allard soils are also associated with Oakville and Scio soils. In contrast with Oakville soils, they have a silty mantle. They are better drained than the moderately well drained Scio soils.

Typical pedon of Allard silt loam, 3 to 8 percent slopes, in a hayfield in the town of Warwick, one-half mile south of New York Route 17A and one-eighth mile west of junction of Bail and Brady Roads:

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.
B21—9 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine granular structure; friable; many roots; few pores; 3 percent coarse fragments; strongly acid; gradual smooth boundary.
B22—15 to 35 inches; yellowish brown (10YR 5/6) silt loam; moderate fine subangular blocky structure; friable; few roots; strongly acid; clear wavy boundary.
IIC—35 to 60 inches; dark brown (10YR 4/3) stratified coarse sand; single grain; loose; 12 percent coarse fragments; strongly acid.

Solum thickness and depth to sand or sand and gravel ranges from 20 to 35 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 3 percent in the solum and from 0 to 65 percent in the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The texture is silt loam, very fine sandy loam, or fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The texture is very fine sandy loam or silt loam. Structure is weak or moderate and granular or subangular blocky. Reaction is very strongly acid to strongly acid above 30 inches and can range to medium acid with increasing depth.

The C horizon has hue of 7.5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. It is stratified sand to loamy sand and gravel. Reaction is strongly acid to neutral.

Arnot series

The Arnot series consists of shallow, somewhat excessively drained to moderately well drained, gently sloping to very steep soils on uplands. These soils formed in glacial till deposits derived from brown and gray sandstone.

Arnot soils commonly are closely associated with Lordstown soils. They are shallow over bedrock, whereas Lordstown soils are moderately deep. Arnot soils are also associated with Swartswood and Wurtsboro soils. They are less than 20 inches deep over bedrock, whereas Swartswood and Wurtsboro soils are more than 60 inches deep.

Typical pedon of Arnot channery silt loam in an area of Arnot-Lordstown complex, sloping, in an idle field in the town of Deerpark, west of Port Jervis on New York Route 42, 250 feet east of New York Route 42 at the intersection of Old Cahoonzie and Quarry Hill Roads:

Ap—0 to 4 inches; dark brown (7.5YR 3/2) channery silt loam; weak fine granular structure; friable; many roots; 25 percent coarse fragments; very strongly acid; abrupt smooth boundary.
B2—4 to 15 inches; reddish brown (5YR 4/4) very channery silt loam; weak fine granular structure; friable; many roots; 40 percent coarse fragments; very strongly acid; abrupt smooth boundary.
R—15 inches; brown and gray sandstone, horizontally bedded.

Solum thickness and depth to bedrock ranges from 10 to 20 inches. The content of coarse fragments by

volume ranges from 15 to 35 percent in the surface layer and from 35 to 55 percent in the subsoil.

The A horizon has hue of 7.5YR to 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is channery silt loam or channery loam. Reaction ranges from extremely acid to medium acid.

The B horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 or 4. Texture ranges from very channery silt loam to very channery loam. Structure is weak or moderate granular. Reaction ranges from extremely acid to medium acid.

The R horizon is hard sandstone bedrock that in places is interbedded with shale or siltstone.

Barbour series

The Barbour series consists of deep, well drained, nearly level soils. These soils formed in alluvial sediments on flood plains in the Neversink River Valley.

Barbour soils formed in the same kind of parent material as the moderately well drained to somewhat poorly drained Basher soils. Barbour soils are also similar to Tioga, Middlebury, and Wayland soils. They are redder than those soils, however, and occur only in the town of Deerpark, in the Neversink River Valley.

Typical pedon of Barbour fine sandy loam in a pasture in the town of Deerpark, 1,500 feet east of New York Route 209 and 3,000 feet west of the Neversink River:

Ap—0 to 11 inches; dark reddish brown (5YR 3/3) fine sandy loam, light reddish brown (5YR 6/3) dry; weak fine granular structure; friable; common roots; strongly acid; abrupt smooth boundary.

B21—11 to 19 inches; reddish brown (5YR 4/4) very fine sandy loam; weak fine subangular blocky structure; friable; common roots; few pores; strongly acid; gradual wavy boundary.

B22—19 to 28 inches, reddish brown (5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; few roots; few pores; strongly acid; clear smooth boundary.

IIC—28 to 60 inches; brown (7.5YR 4/4) fine sand; single grain; loose; few roots; very strongly acid.

Solum thickness ranges from 18 to 30 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 15 percent in the surface layer, from 3 to 35 percent in the subsoil, and from 3 to 55 percent in the substratum.

The A horizon has hue of 7.5YR or 5YR, value of 3, and chroma of 2 or 3. Texture ranges from fine sandy loam to silt loam. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4. Texture is loam, silt loam, very fine sandy loam, or sandy loam, or the gravelly analogs. Structure is weak to moderate subangular blocky. Reaction ranges from very strongly acid to medium acid.

The IIC horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4. It is loamy sand to stratified sand and gravel. Reaction ranges from very strongly acid to slightly acid.

Basher series

The Basher series consists of deep, moderately well drained to somewhat poorly drained, nearly level soils. These soils formed in alluvial sediment on flood plains in the Neversink River Valley.

Basher soils formed in the same kind of parent material as the well drained Barbour soils. Basher soils are also similar to Tioga, Middlebury, and Wayland soils. They are redder than those soils, however, and occur only in the town of Deerpark, in the Neversink River Valley.

Typical pedon of Basher fine sandy loam in a hayfield in the town of Deerpark, 30 feet west of Basher Kill, 200 feet south of New York Route 211, and 1 mile east of Cuddebackville on New York Route 211:

Ap—0 to 13 inches; dark brown (7.5YR 3/2) fine sandy loam; weak fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B21—13 to 23 inches; reddish brown (5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common roots; strongly acid; gradual wavy boundary.

B22—23 to 30 inches; reddish brown (5YR 4/4) fine sandy loam; few fine distinct brown (7.5YR 5/4) and few fine distinct reddish gray (5YR 5/2) mottles; weak medium subangluar blocky structure; friable; common roots; strongly acid; clear wavy boundary.

C—30 to 60 inches; reddish brown (5YR 5/4) very fine sandy loam; common fine distinct yellowish red (5YR 5/8) and common fine distinct reddish gray (5YR 5/2) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; few roots; medium acid.

Solum thickness ranges from 18 to 40 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 10 percent in the surface layer and from 3 to 20 percent in the subsoil and substratum.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 3 and 2. Texture is fine sandy loam to silt loam. Reaction ranges from extremely acid to medium acid.

The B horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4 or 6. Texture is loam, silt loam, very fine sandy loam, or fine sandy loam, or the gravelly analogs. Reaction ranges from extremely acid to medium acid.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 or 4. Texture is loam, very fine sandy loam, silt loam, or fine sandy loam, or the gravelly ana-

logs. Reaction ranges from very strongly acid to slightly acid.

Bath series

The Bath series consists of deep, well drained, gently sloping and sloping soils on uplands. These soils formed in glacial till deposits derived from gray and brown sandstone and shale. They have a fragipan.

Bath soils occupy undulating to rolling topography and are closely associated with Nassau soils. They are deep over bedrock, whereas Nassau soils are shallow. Bath soils are also associated with Mardin and Erie soils and form a drainage sequence with those soils. In contrast to those soils, Bath soils have better natural drainage and are deeper over the fragipan.

Typical pedon of Bath shaly silt loam in an area of Bath-Nassau shaly silt loams, 3 to 8 percent slopes, in a hayfield in the town of Minisink, 2,000 feet east of intersection of Stateline and Lower Roads and 25 feet south of Stateline Road:

Ap—0 to 9 inches; dark brown (10YR 3/3) shaly silt loam; moderate fine granular structure; friable; many roots; 15 percent coarse fragments; medium acid; abrupt smooth boundary.

B21—9 to 16 inches; yellowish brown (10YR 5/6) shaly silt loam; moderate fine subangular blocky structure; friable; common roots; 15 percent coarse fragments; common pores; medium acid; clear wavy boundary.

B22—16 to 26 inches; yellowish brown (10YR 5/4) shaly silt loam; moderate medium subangular blocky structure; friable; common roots; 20 percent coarse fragments; common pores; medium acid; clear wavy boundary.

B23—26 to 29 inches; olive brown (2.5Y 4/4) shaly silt loam; few fine faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few roots; 30 percent coarse fragments; few pores; slightly acid; clear wavy boundary.

Bx—29 to 53 inches; olive brown (2.5Y 4/4) very shaly silt loam; weak very coarse prismatic structure; firm, brittle; 35 percent coarse fragments; light yellowish brown (2.5Y 6/4) prism faces with strong brown (7.5YR 5/6) borders; few pores; patchy clay films in pores; medium acid; abrupt wavy boundary.

IIR—53 inches; dark gray shale bedrock.

Solum thickness ranges from 40 to 60 inches. Depth to the fragipan ranges from 26 to 40 inches. Depth to bedrock ranges from 40 to 60 inches. The content of coarse fragments by volume ranges from 3 to 35 percent in the upper part of the solum and from 15 to 60 percent in the fragipan and substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is mainly shaly silt loam but includes silt loam, loam, or shaly loam. Reaction ranges from very strongly acid to medium acid.

The B2 horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture is silt loam or loam, or the shaly or channery analogs.

The Bx horizon is firm and brittle and has colors similar to those in the B2 horizon. Texture ranges from silt loam to sandy loam and to the shaly, very shaly, or channery analogs. Structure is platy or subangular blocky within very coarse prisms. Reaction ranges from very strongly acid to slightly acid.

Some pedons have a C horizon. This horizon has hue of 7.5YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture ranges from silt loam to sandy loam and to the shaly, very shaly, or flaggy analogs. Reaction ranges from strongly acid to moderately alkaline.

Bedrock is dominantly shale. The upper 1 or 2 feet is commonly soft.

Canandaigua series

The Canandaigua series consists of deep, poorly drained and very poorly drained, nearly level soils. These soils formed in glaciolacustrine deposits in depressional areas of the upland and lowland plains.

Canandaigua soils and the nearby well drained Unadilla soils, moderately well drained Scio soils, and somewhat poorly drained to poorly drained Raynham soils formed in similar parent material. Canandaigua soils have a higher clay content in the subsoil than those soils.

The Canandaigua soils in this survey area are taxadjuncts to the Canandaigua series because they are underlain by coarse textured sandy sediment and their surface layer is light colored when dry.

Typical pedon of Canandaigua silt loam in a wooded area in the town of Newburgh, 2,000 feet south of New York Route 17K and one-half mile west of Newburgh city line:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; common roots; slightly acid; clear wavy boundary.

B21g—8 to 20 inches; dark grayish brown (10YR 4/2) silt loam; few fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; common roots; many pores; thin clay films in pores; neutral; abrupt wavy boundary.

B22g—20 to 35 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and common medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable; few roots; many pores; clay films in pores; neutral; clear wavy boundary.

IIC1—35 to 50 inches; dark brown (10YR 3/3) fine sand; common medium distinct strong brown (7.5YR 5/8) and common medium distinct gray (2.5Y 5/0) mottles; massive; friable, nonsticky and nonplastic; neutral; clear wavy boundary.

IIC2—50 to 60 inches; dark brown (10YR 3/3) fine sand; massive; friable, nonsticky and nonplastic; mildly alkaline.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments is commonly zero, but it can range up to 5 percent by volume in the solum and up to 35 percent in the substratum.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 0 to 2. Texture is silt loam or silty clay loam. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 10YR to 2.5Y, value of 5 or 6, and chroma of 0 to 2. Texture is silty clay loam or silt loam. Reaction ranges from medium acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 3. It is gravelly sand to loamy fine sand that is commonly stratified. Reaction is neutral to moderately alkaline.

Carlisle series

The Carlisle series consists of deep, very poorly drained, nearly level soils. These soils formed in organic deposits in low depressional areas in lake plains, alluvial plains, and till plains throughout the county.

Carlisle soils formed in the same type of organic deposits as Palms soils. They are 51 inches or deeper over mineral soil, whereas Palms soils are less than 51 inches. Carlisle soils are also associated with Wayland, Middlebury, and Wallkill soils. They are organic material, whereas Middlebury and Wayland soils are mineral soils. Walkill soils have a mineral cap over the organic layers.

Typical pedon of Carlisle muck in a cultivated field in the town of Wawayanda, 2,000 feet east of Lower Road and Rutgers Creek off Farm Road:

Oa1—0 to 15 inches; black (5YR 2/1 broken face and rubbed) muck (sapric material); 5 percent fiber unrubbed, 3 percent rubbed; moderate fine granular structure; friable; fibers are sedges; medium acid; abrupt smooth boundary.

Oa2—15 to 42 inches; very dark gray (5YR 3/1 broken face) and dark reddish brown (5YR 2/2 rubbed) muck (sapric material); about 15 percent fiber unrubbed, less than 5 percent rubbed; massive; friable; fibers are sedges; 5 percent woody fragments; slightly acid; clear smooth boundary.

Oa3—42 to 61 inches; dark brown (7.5YR 3/2 broken face and rubbed) muck (sapric material); 5 percent fiber unrubbed, less than 5 percent rubbed; massive; friable; 5 percent woody fragments; slightly acid; clear smooth boundary.

Oa4—61 to 94 inches; very dark gray (5YR 3/1 broken face and rubbed) muck (sapric material); 30 percent fiber unrubbed, less than 10 percent rubbed; massive; friable; 5 percent woody fragments; fibers are reeds; 10 to 20 percent mineral material; neutral; abrupt smooth boundary.

IICg—94 to 144 inches; gray (5YR 5/1) silt; massive; friable; moderately alkaline, strongly calcareous.

Thickness of the organic deposits is more than 51 inches. Depth to bedrock is more than 5 feet. The content of woody fragments by volume ranges up to 15 percent.

The surface layer has hue of 5YR, value of 2, and chroma of 1 or 2. Some profiles contain varying proportions of both sapric and hemic materials, but sapric material is dominant. Reaction ranges from medium acid to neutral.

The subsurface layers have hue of 7.5YR or 5YR, value of 2 or 3, and chroma of 0 to 3. Chroma or value may change by 2 units if the material is rubbed. These layers are predominantly sapric material. The rubbed fiber content is less than 10 percent. Reaction ranges from medium acid to neutral in the upper part and is slightly acid to neutral in the lower part.

The mineral soil below the organic material is generally gray. It is dominantly silt or silt and clay. Reaction is neutral to moderately alkaline.

Castile series

The Castile series consists of deep, moderately well drained, nearly level to gently sloping soils. These soils formed in glaciofluvial deposits on valley terraces, outwash plains, and associated kames.

Castile soils formed in the same kind of parent material as the somewhat excessively drained Hoosic and Chenango soils, somewhat poorly drained to poorly drained Fredon soils, and very poorly drained Halsey soils.

The Castile soils in this survey area are taxadjuncts to the series because they generally do not have low chroma mottles within a depth of 24 inches, and they are dominantly slightly acid in the subsoil.

Typical pedon of Castile gravelly silt loam, 3 to 8 percent slopes, in a hayfield in the town of Warwick, 600 feet west of Route New York 17A and one-half mile southeast of village of Warwick:

Ap—0 to 9 inches; dark brown (10YR 3/3) gravelly silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many roots; 25 percent coarse fragments; medium acid; abrupt smooth boundary.

B21—9 to 14 inches, brown (10YR 4/3) very gravelly loam; weak fine granular structure; friable; many roots; 40 percent coarse fragments; slightly acid; clear wavy boundary.

B22—14 to 28 inches; dark brown (10YR 3/3) very gravelly loam; few fine distinct olive yellow (2.5Y 6/6) mottles; weak very fine granular structure; very friable; common roots; 50 percent coarse fragments; slightly acid; abrupt wavy boundary.

IIC1—28 to 45 inches; brown (10YR 4/3) gravelly silt loam; few fine distinct olive yellow (2.5Y 6/6) mot-

tles; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; 25 percent coarse fragments; slightly acid; clear wavy boundary.

IIC2—45 to 50 inches; dark brown (10YR 4/3) gravelly silt loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; 25 percent coarse fragments; neutral; clear wavy boundary.

IIIC3—50 to 60 inches; dark brown (10YR 4/3) very gravelly loam; massive; friable, slightly sticky and slightly plastic; 50 percent coarse fragments; neutral.

Solum thickness ranges from 24 to 36 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 15 to 35 percent in the surface layer, from 20 to 50 percent in the subsoil and upper part of the substratum, and from 35 to 60 percent in the lower part of the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture ranges from gravelly silt loam to gravelly loam. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 3 or 4. Texture is gravelly or very gravelly sandy loam and in many places is stratified. The granular or subangular blocky. Reaction ranges from very strongly acid to slightly acid.

The C horizon has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is very gravelly loam to very gravelly sandy loam and in many places is stratified. The upper part is commonly gravelly silt loam. Reaction ranges from strongly acid to neutral.

Charlton series

The Charlton series consists of deep, well drained, gently sloping to steep soils. These soils formed in glacial till deposits on mountainous uplands.

Charlton soils formed in parent material similar to that of the well drained Paxton soils. They do not have a fragipan; Paxton soils have a pan. Charlton soils are also associated with Hollis and Mardin soils. Charlton soils are deep over bedrock, whereas Hollis soils are shallow. Charlton soils have a higher sand content than Mardin soils. Mardin soils have a fragipan.

Typical pedon of Charlton fine sandy loam in a wooded area of Charlton-Paxton complex, extremely stony, sloping, in the town of Highland, 200 feet south of Craystown Lake, off Military Road, and 1,100 feet west of Highland Falls High School:

Ap—0 to 9 inches; dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; friable; many roots; 10 percent coarse fragments; strongly acid; clear smooth boundary.

B21—9 to 18 inches; yellowish brown (10YR 5/6) gravelly loam; weak medium subangular blocky structure; friable; common roots; many pores; 20 percent coarse fragments; strongly acid; clear smooth boundary.

B22—18 to 25 inches; yellowish brown (10YR 5/6) gravelly sandy loam; weak medium granular structure; friable; few roots; few pores; 20 percent coarse fragments; very strongly acid; abrupt wavy boundary.

C1—25 to 42 inches; light olive brown (2.5Y 5/4) gravelly sandy loam; massive; very friable; few pores; 30 percent coarse fragments; strongly acid; clear wavy boundary.

C2—42 to 60 inches; light olive brown (2.5Y 5/4) very gravelly sandy loam; massive; very friable; 55 percent coarse fragments; medium acid.

Solum thickness ranges from 20 to 30 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 5 to 20 percent in the surface layer, from 5 to 30 percent in the subsoil, and from 15 to 55 percent in the substratum.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is dominantly fine sandy loam but includes gravelly fine sandy loam and gravelly loam. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 7.5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is gravelly sandy loam to loam. Reaction ranges from very strongly acid to medium acid.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture is gravelly or very gravelly sandy loam to loam. Reaction ranges from very strongly acid to medium acid.

Chenango series

The Chenango series consists of deep, somewhat excessively drained to well drained, nearly level to sloping soils. These soils formed in glaciofluvial deposits on valley terraces, kames, and outwash plains.

Chenango soils are in a drainage sequence with the moderately well drained Castile soils, somewhat poorly drained to poorly drained Fredon soils, and very poorly drained Halsey soils. They are also near and similar to Hoosic and Otisville soils. Chenango soils have more silt and clay in the subsoil than either of those soils.

Typical pedon of Chenango gravelly silt loam, 3 to 8 percent slopes, in an idle field in the town of Wallkill, three-eighths of a mile northwest of New York 211 and 100 yards northeast of Camp Orange Road:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly silt loam; weak fine granular structure; friable; many roots; 30 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—6 to 19 inches; yellowish brown (10YR 5/4) very gravelly silt loam; moderate fine subangular blocky structure; friable; common roots; few pores; thin patchy silt and clay films on some peds; 40 percent coarse fragments; strongly acid; clear wavy boundary.

B22—19 to 28 inches; dark brown (10YR 4/3) very gravelly loam; weak medium subangular blocky structure;

friable; few roots; common pores; 45 percent coarse fragments; medium acid; clear wavy boundary.

IIC—28 to 60 inches; dark grayish brown (10YR 4/2) stratified sand and gravel; single grain; loose; 60 percent coarse fragments; medium acid.

Solum thickness ranges from 24 to 30 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 15 to 60 percent in the solum and from 30 to 70 percent in the substratum. To a depth of 6 to 8 feet white coats of carbonates occur on the bottom of pebbles.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is gravelly silt loam to gravelly sandy loam. Reaction ranges from very strongly acid to strongly acid.

The B horizon has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture is gravelly or very gravelly fine sandy loam, loam, or silt loam. Reaction ranges from very strongly acid to medium acid.

The C horizon has hue of 10YR to 2.5Y, value of 3 or 4, and chroma of 2 to 4. Texture is stratified gravel and sand, very gravelly sand, or gravelly loamy fine sand.

Collamer series

The Collamer series consists of deep, moderately well drained, gently sloping to moderately steep soils. These soils formed in silty glaciolacustrine deposits on lake plains and in valleys.

Collamer soils are in a drainage sequence with the poorly drained and very poorly drained Canandaigua soils. They are near and similar to Scio and Unadilla soils. They have a lower content of very fine sand and fine sand than those soils.

Typical pedon of Collamer silt loam, 3 to 8 percent slopes, in a wooded area in the town of Newburgh, 150 feet east of Soap Hill Road and 100 feet north of the Central Hudson power plant:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B2—6 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many roots; many pores; medium acid; clear wavy boundary.

B&A—10 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common roots; common pores; grayish brown (10YR 5/2) albic material 1 to 2 mm thick on surface of peds; thin clay films in pores; medium acid; clear boundary.

B21t—12 to 28 inches; light olive brown (2.5Y 5/4) heavy silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few roots; common pores; clay films on ped faces and in pores; medium acid; clear wavy boundary.

B22t—28 to 35 inches; olive brown (2.5Y 4/4) heavy silt loam; common medium distinct strong brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; firm; common pores; thin clay films on ped faces and in pores; slightly acid; clear wavy boundary.

C—35 to 60 inches; dark brown (10YR 4/3) varved very fine sand and silt; massive; firm; slightly acid.

Solum thickness ranges from 25 to 40 inches. Depth to carbonates ranges from 40 to 72 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments is generally zero but can range up to 3 percent by volume throughout the soil.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 3. Texture ranges from silt loam to fine sandy loam. Reaction ranges from strongly acid to neutral.

The B2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. Texture is very fine sandy loam, silt loam, or fine sandy loam. Reaction ranges from strongly acid to neutral.

The B&A horizon has colors similar to those of the B2 horizon and B2t horizon. It is 15 to 25 percent albic material in a matrix that is like the underlying B2t horizon. Texture is very fine sandy loam, heavy silt loam, or fine sandy loam. Reaction ranges from strongly acid to neutral.

The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Texture is silt loam or silty clay loam. Reaction ranges from medium acid to mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3. Texture is varved very fine sand, heavy silt loam, or silt. Reaction ranges from slightly acid to moderately alkaline.

Erie series

The Erie series consists of deep, somewhat poorly drained, nearly level to gently sloping soils. These soils formed in glacial till deposits in uplands.

Erie soils form a drainage sequence with the moderately well drained Mardin soils and well drained Bath soils. They are also near Nassau soils. Erie soils are deep over bedrock, whereas Nassau soils are shallow.

Typical pedon of Erie gravelly silt loam, 3 to 8 percent slopes, in a hayfield in the town of Wallkill, 500 feet east of County Route 92 and 100 feet north of Buckley Smith Road:

Ap—0 to 9 inches; dark brown (10YR 3/3) gravelly silt loam; moderate fine granular structure; friable; many roots; 15 percent coarse fragments; strong brown (7.5YR 5/6) root stains; medium acid; abrupt wavy boundary.

B2—9 to 18 inches; grayish brown (2.5Y 5/2) channery silt loam; common medium distinct yellowish brown

(10YR 5/6) mottles and few fine distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable; few roots; 15 percent coarse fragments; common pores; slightly acid; clear wavy boundary.

Bx1t—18 to 31 inches; olive brown (2.5Y 4/4) channery silt loam; common medium distinct yellowish brown (10YR 5/6) mottles and common medium distinct gray (10YR 5/1) mottles; moderate very coarse prismatic structure parting to weak fine subangular blocky; firm, brittle; few roots; 20 percent coarse fragments; few pores; thin clay films on prism faces; slightly acid; clear wavy boundary.

Bx2t—31 to 54 inches; olive brown (2.5Y 4/4) channery silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; strong very coarse prismatic structure parting to weak fine subangular blocky; gray (10YR 5/1) prism faces and strong brown (7.5YR 5/6) borders; firm, brittle; 20 percent coarse fragments; thin clay films on prism faces; slightly acid; clear wavy boundary.

C—54 to 70 inches; olive brown (2.5Y 4/4) channery silt loam; few medium distinct strong brown (7.5YR 5/6) mottles and few medium distinct gray (10YR 5/1) mottles; massive; firm; 20 percent coarse fragments; neutral.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 5 feet. Depth to the top of the fragipan is 10 to 24 inches. The content of coarse fragments by volume ranges from 15 to 35 percent in the solum above the fragipan and from 20 to 50 percent in the pan and the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is gravelly silt loam to gravelly fine sandy loam. Reaction ranges from very strongly acid to medium acid in unlimed areas.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. Texture is channery silt loam to channery fine sandy loam. Reaction ranges from strongly acid to slightly acid.

The Bx horizon has hue of 10YR to 2.5Y, value of 3 or 4, and chroma of 2 or 4. Texture is channery silty clay loam to very channery loam. Reaction ranges from strongly acid to mildly alkaline.

The C horizon has hue of 10YR to 2.5Y, value of 3 or 4, and chroma of 2 to 4. Texture is channery silty clay loam to very channery loam. Reaction ranges from medium acid to moderately alkaline.

Farmington series

The Farmington series consists of shallow, well drained, sloping to steep soils on till plains in uplands. These soils formed in glacial till deposits.

Farmington soils are closely associated with the well drained Pittsfield soils but are not as deep over bedrock as those soils. They are also associated with the deep, moderately well drained Collamer soils and the deep, well drained Unadilla soils. In contrast with those soils, they are shallower over bedrock and contain more coarse fragments.

Typical pedon of Farmington silt loam, sloping, in a pasture in the town of Warwick, 20 feet east of Pine Island Turnpike and 40 feet east of Mountain Side Road and Pine Island Turnpike:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many roots; 5 percent coarse fragments; slightly acid; abrupt clear boundary.

B2—8 to 19 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common roots; 10 percent coarse fragments; neutral; abrupt irregular boundary.

IIR—19 inches, hard gray limestone bedrock.

Solum thickness and depth to bedrock ranges from 10 to 20 inches. The content of coarse fragments by volume ranges from 5 to 15 percent in the surface layer and from 5 to 30 percent in the subsoil.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Texture is silt loam, loam, or fine sandy loam. Reaction ranges from strongly acid to slightly acid.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Texture is silt loam, loam, or fine sandy loam, or the gravelly or cherty analogs. Reaction ranges from medium acid to mildly alkaline.

Bedrock is hard limestone or limy shale.

Fluvaquents

The Fluvaquents in Orange County are deep, somewhat poorly drained to very poorly drained soils that formed in recent alluvial deposits. They have little or no profile development. They are adjacent to streams and are subject to frequent flooding.

Fluvaquents are mapped with Udifluvents. They are near Tioga, Middlebury, Wayland, Barbour, and Basher soils but are in areas where the adjacent stream, through scouring, cutting, and lateral erosion, frequently shifts the soil material from place to place.

Because Fluvaquents are highly variable, no typical pedon is provided. The solum is the A horizon, which is 1 to 6 inches thick. Depth to bedrock is generally more than 5 feet. The content of coarse fragments, including pebbles, cobblestones, and flagstones, ranges from 0 to 80 percent by volume. These soils are very strongly acid to mildly alkaline. Organic matter content decreases irregularly with increasing depth.

The A horizon has hue of 5YR to 5Y, value of 2 to 4, and chroma of 0 to 2. Texture ranges from fine sand to silty clay loam or to the channery, gravelly, or very gravelly analogs.

The C horizon has hue of 5YR to 5Y, value of 3 to 6, and chroma of 0 to 3. It is commonly mottled. Texture

ranges from sand to silty clay loam or to the gravelly, channery, cobbly, or very gravelly analogs. Consistence is friable or loose.

Fredon series

The Fredon series consists of deep, somewhat poorly drained and poorly drained, nearly level soils. These soils formed in glaciofluvial deposits on low outwash terraces and old stream terraces.

Fredon soils are in a drainage sequence with the somewhat excessively drained Hoosic soils, moderately well drained Castile soils, very poorly drained Halsey soils, and well drained to somewhat excessively drained Chenango soils.

Typical pedon of Fredon loam in a hayfield in the town of Wallkill, 300 feet north of Stony Ford Road and 50 feet east of Mechanicstown Fire Substation:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many roots; 5 percent coarse fragments; medium acid; clear wavy boundary.

B21—6 to 10 inches; grayish brown (2.5Y 5/2) very fine sandy loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; many roots; 5 percent coarse fragments; medium acid; clear wavy boundary.

B22—10 to 15 inches; light yellowish brown (2.5Y 6/4) very fine sandy loam; few fine faint brownish yellow (10YR 6/6) mottles; weak medium platy structure; friable; few roots; 5 percent coarse fragments; medium acid; clear smooth boundary.

B23—15 to 24 inches; brown (10YR 5/3) fine sandy loam; few fine faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few roots; 5 percent coarse fragments; slightly acid; clear smooth boundary.

IIC—24 to 60 inches; grayish brown (2.5Y 5/2) stratified gravelly sand; single grain; loose; 30 percent coarse fragments; slightly acid; abrupt smooth boundary.

Solum thickness ranges from 22 to 35 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 3 to 35 percent in the solum and from 10 to 60 percent in the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Texture is silt loam, loam, or gravelly sandy loam. Reaction ranges from medium acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. Texture is sandy loam, very fine sandy loam, loam, or silt loam, or the gravelly analogs. Reaction ranges from medium acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It is gravelly or very gravelly sand to loamy fine sand and is commonly stratified. Some pedons are not gravelly. Reaction ranges from slightly acid to moderately alkaline.

Halsey series

The Halsey series consists of deep, very poorly drained, nearly level soils. These soils formed in glaciofluvial deposits in shallow depressions in glacial outwash plains and low terraces.

Halsey soils are in a drainage sequence with the somewhat excessively drained Hoosic and Chenango soils, moderately well drained Castile soils, and somewhat poorly drained to poorly drained Fredon soils. They are similar to Alden soils but have a higher content of sand and gravel in the substratum.

Typical pedon of Halsey silt loam in an idle field in the town of Hamptonburgh, 175 feet west of Maybrook Road and 1 mile south of the village of Maybrook:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/3) silt loam; few fine distinct yellowish brown (10YR 5/8) mottles; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21g—6 to 10 inches; gray (5Y 5/1) silt loam; many fine distinct light olive brown (2.5Y 5/6) mottles and few fine distinct very dark grayish brown (10YR 3/2) mottles; weak fine subangular blocky structure; very friable; many roots; 5 percent coarse fragments; medium acid; clear wavy boundary.

B22g—10 to 14 inches; light olive gray (5Y 6/2) silt loam; many medium distinct brownish yellow (10YR 6/6) mottles and few fine distinct very dark grayish brown (10YR 3/2) mottles; moderate medium platy structure; friable; common roots; 10 percent coarse fragments; medium acid; clear wavy boundary.

B23g—14 to 22 inches; light gray (5Y 6/1) silt loam; many coarse distinct strong brown (7.5YR 5/8) mottles and few fine distinct very dark grayish brown (10YR 3/2) mottles; moderate medium platy structure; friable; few roots; 10 percent coarse fragments; medium acid; abrupt wavy boundary.

IIC1g—22 to 26 inches; dark gray (N 4/0) stratified sand and gravel; single grain; loose; 50 percent coarse fragments; slightly acid; clear wavy boundary.

IIC2g—26 to 60 inches, very dark gray (N 3/0) stratified sand and gravel; single grain; loose; 60 percent coarse fragments; neutral.

Solum thickness and depth to the sand and gravel ranges from 22 to 30 inches. Depth to carbonates is 40 to 80 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 30 percent in the solum and from 10 to 60 percent in the substratum.

The A horizon is neutral or has hue of 10YR, value of 2 or 3, and chroma of 0 to 2. Texture is gravelly sandy loam to silt loam. Reaction ranges from medium acid to neutral.

The B horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2. Mottles range from gray to strong

brown. Texture ranges from gravelly loam to silt loam. Reaction ranges from medium acid to neutral.

The C horizon is neutral or has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 0 to 2. It is stratified sand and gravel or very gravelly sand to sandy loam. Reaction is slightly acid to moderately alkaline.

Histic Humaquepts

The Histic Humaquepts in Orange County are deep, very poorly drained, level soils that are covered with shallow water throughout most of the year. These mineral soils have a dark surface that is rich in organic matter. They formed in glacial till. Lacustrine, outwash, and alluvial deposits, in low areas commonly adjacent to natural or manmade bodies of water. They are near Alden, Halsey, and Wayland soils but are in slightly lower areas that remain ponded most of the year. They support water-tolerant plants such as cattails, lily pads, and marsh grass.

Because Histic Humaquepts are highly variable, a typical pedon is not provided. The solum ranges from 8 to 36 inches thick. Depth to bedrock is more than 5 feet. The content of coarse fragments, including pebbles and cobblestones, ranges from 0 to 50 percent by volume. These soils are very strongly acid or strongly acid in the solum but generally become less acid with increasing depth.

The O horizon is well decomposed or moderately decomposed organic material 4 to 16 inches thick. It is neutral or has hue of 5YR to 2.5Y, value of 2 or 3, and chroma of 0 to 2.

The B horizon has due of 5YR to 5Y, value of 3 to 7, and chroma of 0 to 3. In places it is mottled. Texture ranges from silty clay loam to sandy loam or to the gravelly or very gravelly analogs. Structure is subangular blocky or prismatic.

The C horizon has colors similar to those in the B horizon. Texture ranges from silty clay loam to loamy sand. Structure is generally lacking or is weak platy. Consistence is loose to firm.

Hollis series

The Hollis series consists of shallow, somewhat excessively drained and well drained, gently sloping to very steep soils on bedrock-controlled mountainous uplands. These soils formed in glacial till deposits derived from crystalline rock, dominantly schist, granite, and gneiss.

Hollis soils commonly occupy mountainous areas in close association with the deep, well drained Charlton and Paxton soils. Hollis soils are less than 20 inches deep over bedrock, whereas Charlton and Paxton soils are 5 feet deep or more. Hollis soils are similar to Arnot soils, but they are underlain by granitic bedrock and Arnot soils by sandstone.

Typical pedon of Hollis gravelly loam in an area of Rock outcrop-Hollis complex, sloping, in a wooded area in the town of Tuxedo, 200 yards south of New York Route 210 and one-fourth mile east of Interstate 87:

O2—3 to 0 inches; dark reddish brown (5YR 3/2) loose decomposed roots, sticks, and leaves; strongly acid; abrupt smooth boundary.
A1—0 to 4 inches; dark brown (10YR 4/3) gravelly loam; moderate medium granular structure; very friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.
B2—4 to 14 inches; strong brown (7.5YR 5/6) gravelly loam; moderate medium subangular blocky structure; friable; many roots; common pores; 20 percent coarse fragments; strongly acid; abrupt smooth boundary.
IIR—14 inches; hard gray granitic bedrock.

Solum thickness and depth to bedrock ranges from 10 to 20 inches. The content of coarse fragments by volume ranges from 2 to 25 percent in the solum.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 2 or 3. Texture ranges from loam to sandy loam or to the gravelly analogs. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 5 or 6. Texture ranges from loam to sandy loam or to the gravelly analogs. Reaction ranges from very strongly acid to medium acid.

Hoosic series

The Hoosic series consists of deep, somewhat excessively drained, nearly level to steep soils. These soils formed in glaciofluvial deposits on terraces, kames, and outwash plains.

Hoosic soils are in a drainage sequence with the moderately well drained Castile soils, somewhat poorly drained to poorly drained Fredon soils, and very poorly drained Halsey soils. Hoosic soils are near Otisville and Chenango soils. They are less sandy in the upper part of the subsoil than Otisville soils and are less silty in the subsoil than Chenango soils.

Typical pedon of hoosic gravely sandy loam, 3 to 8 percent slopes, at the edge of a gravel pit in the town of Mount Hope, one-half mile southeast of the village of Otisville on County Route 11 and 200 feet east of County Route 11 at east end of Mount Hope Cemetery:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly sandy loam; weak fine granular structure; friable; many roots; 30 percent coarse fragments; medium acid (limed); abrupt smooth boundary.
B21—6 to 11 inches; yellowish brown (10YR 5/6) gravelly sandy loam; weak fine granular structure; friable; common roots; many pores; 30 percent coarse fragments; strongly acid; clear wavy boundary.
B22—11 to 22 inches; yellowish brown (10YR 5/6) very gravelly sandy loam; weak fine granular structure;

friable; common roots; many pores; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.

B3—22 to 28 inches; yellowish brown (10YR 5/4) very gravelly loamy sand; weak fine granular structure; very friable; few roots; common pores; 45 percent coarse fragments; strongly acid; gradual wavy boundary.

IIC—28 to 60 inches; light olive brown (2.5Y 5/4) very gravelly sand; single grain; loose; 55 percent coarse fragments; strongly acid.

Solum thickness ranges from 22 to 36 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 15 to 50 percent in the solum and from 35 to 60 percent in the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Texture is gravelly loam to very gravelly sandy loam. Reaction ranges from very strongly acid to strongly acid in unlimed areas.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. Texture is gravelly or very gravelly loam or sandy loam. Reaction ranges from very strongly acid to strongly acid.

The B3 and C horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. They are very gravelly sand or very gravelly loamy sand and are commonly stratified. Reaction ranges from very strongly acid to medium acid.

Lordstown series

The Lordstown series consists of moderately deep, well drained, gently sloping to very steep soils. These soils formed in glacial till deposits derived mostly from brown and yellow sandstone. They occur on bedrock controlled upland glacial till plains.

Lordstown soils commonly occupy low mountainous areas in close association with the shallow Arnot soils. Lordstown soils are 20 to 40 inches deep over bedrock, whereas Arnot soils are only 10 to 20 inches deep. Lordstown soils are also associated with the deep, well drained Swartswood soils and moderately well drained Wurtsboro soils. They are shallower over bedrock than those soils.

Typical pedon of Lordstown channery silt loam, in a wooded area of Arnot-Lordstown complex, sloping, in the town of Deerpark, 10 feet west of Big Pond Road, 2,000 feet south of Prospect Hill road:

O2—2 to 0 inches, very dark gray (10YR 3/1) well decomposed leaf litter; weak fine granular structure; very friable; many roots; abrupt smooth boundary.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) channery silt loam; weak fine granular structure; friable; many roots; 15 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B21—6 to 19 inches; yellowish brown (10YR 5/6) channery loam; weak fine granular structure; friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B22—19 to 37 inches; light olive brown (2.5Y 5/4) channery loam; moderate medium subangular blocky structure; friable; common roots; common pores; 20 percent coarse fragments; strongly acid; abrupt wavy boundary.

IIR—37 inches; brown sandstone bedrock.

Solum thickness and depth to bedrock ranges from 20 to 40 inches. The content of coarse fragments by volume ranges from 15 to 35 percent throughout the soil.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. Texture is channery loam or channery silt loam and, in a few places, flaggy silt loam. Reaction ranges from very strongly acid to slightly acid.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture is channery loam or channery silt loam. Reaction ranges from very strongly acid to medium acid.

Bedrock is typicaly sandstone. In a few places it is interbedded with shale.

Madalin series

The Madalin series consists of deep, poorly drained and very poorly drained, nearly level soils. These soils formed in glaciolacustrine deposits on lake plains and in small basins of the uplands.

Madalin soils formed in the same kind of parent material as the somewhat poorly drained Rhinebeck soils. They are associated with the moderately well drained Collamer soils but have a higher clay content and are not so well drained. They are similar to Canandaigua soils but have a higher clay content in the subsoil.

Typical pedon of Madalin silt loam in an idle field in the town of Goshen near the old fairgrounds, 1,000 feet north of New York Route 17 and 500 feet west of Erie Railroad tracks:

Ap—0 to 8 inches; black (10YR 2/1) silt loam; moderate fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

A2—8 to 10 inches; dark gray (5Y 4/1) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; strong medium angular blocky structure; firm; few roots; medium acid; clear smooth boundary.

B21g—10 to 17 inches; greenish gray (5GY 5/1) heavy silty clay loam; common fine prominent yellowish brown (10YR 5/8) mottles and common fine prominent reddish yellow (7.5YR 7/8) mottles; strong coarse prismatic structure; firm; few roots; many pores; medium acid; gradual wavy boundary.

B22tg—17 to 38 inches; greenish gray (5G 5/1) heavy silty clay loam; strong coarse prismatic structure parting to moderate fine angular blocky; firm; thin continuous dark gray (10YR 4/1) clay films on ped faces and

lining pores; few roots; neutral; gradual wavy boundary.

C—38 to 60 inches; dark gray (5Y 4/1) silty clay; varved; moderate thin platy structure; firm; moderately alkaline, calcareous.

Solum thickness ranges from 24 to 40 inches. Depth to carbonates ranges from 30 to 60 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume is 0 to 2 percent in a few pedons.

The A horizon is neutral or has hue of 10YR, value of 2 or 3, and chroma of 0 to 2. Texture is silt loam or silty clay loam. Reaction ranges from strongly acid to mildly alkaline.

The B horizon is neutral or has hue of 10YR to 5G, value of 3 to 5, and chroma of 0 to 1. Texture is silty clay loam, clay, or silty clay. Reaction ranges from medium acid to mildly alkaline.

The C horizon is neutral or has hue of 10YR to 5Y, value of 3 to 5, and chroma of 0 to 1. Texture is silty clay or clay. Reaction ranges from mildly alkaline to moderately alkaline.

Mardin series

The Mardin series consists of deep, moderately well drained, gently sloping to very steep soils. These soils formed in glacial till deposits in uplands.

Mardin soils formed in the same kind of parent material as the well drained Bath soils and somewhat poorly drained Erie soils. Mardin soils are closely associated with Nassau soils. They are deep over bedrock and have a fragipan, whereas Nassau soils are shallow over bedrock and do not have fragipan.

Typical pedon of Mardin gravelly silt loam, 3 to 8 percent slopes, in an idle field in the town of Wallkill, 250 feet north of Buckley Road and 800 feet east of County Route 92:

Ap—0 to 8 inches, dark brown (10YR 4/3) gravelly silt loam; weak fine granular structure; friable; many roots; 15 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B2—8 to 15 inches; yellowish brown (10YR 5/6) gravelly silt loam; weak medium granular structure; friable; common roots; 20 percent coarse fragments; common pores; strongly acid; clear wavy boundary.

A'2—15 to 20 inches; pale brown (10YR 6/3) gravelly silt loam; common medium distinct light brownish gray (2.5Y 6/2) mottles and common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few roots; 25 percent coarse fragments; few pores; few silt films; strongly acid; clear wavy boundary.

B'x—20 to 60 inches; olive brown (2.5Y 4/4) channery silt loam; weak very coarse prismatic structure parting to weak thin platy; prism exteriors of light brownish gray (10YR 6/2) coated with silt films, prism boarders of strong brown (7.5YR 5/6); firm; 30 percent coarse fragments; medium acid.

Solum thickness ranges from 40 to 65 inches. Depth to the top of the fragipan is 14 to 25 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 10 to 35 percent in the upper part of the solum and from 20 to 50 percent in the fragipan.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is gravelly silt loam or gravelly loam. Reaction ranges from extremely acid to slightly acid.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. Texture is silt loam or loam or the gravelly or channery analogs. Reaction ranges from extremely acid to slightly acid.

The A'2 horizon has hue of 10YR or 2.5Y value of 5 or 6, and chroma of 2 or 3. Texture is silt loam or loam or the gravelly or channery analogs. Reaction ranges from extremely acid to slightly acid.

The B'x horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 4. Texture is very channery or channery loam or silt loam. Reaction ranges from very strongly acid to neutral.

Some pedons have a C horizon. This horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture is channery or very channery silt loam or loam. Reaction is strongly acid to moderately alkaline.

Middlebury series

The Middlebury series consists of deep, moderately well drained to somewhat poorly drained, nearly level soils that formed in recent alluvial sediment. These soils are on flood plans along streams and rivers.

Middlebury soils formed in the same kind of parent material as the associated well drained Tioga soils and poorly drained and very poorly drained Wayland soils. They are also associated with Hoosic soils. They have a lower content of coarse fragments than the better drained Hoosic soils.

Typical pedon of Middlebury silt loam in a cornfield in the town of Crawford, 1,000 feet west of Stone School House Road and one-half mile northwest of Route 17K along Shawangunk Kill:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2); weak fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B21—11 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common roots; medium acid; clear wavy boundary.

B22—17 to 42 inches; yellowish brown (10YR 5/4) very fine sandy loam; common fine distinct light brownish gray (10YR 6/2) mottles and common medium dis-

tinct light yellowish brown (2.5Y 6/4) mottles; moderate medium subangular blocky structure; friable; few roots; medium acid; abrupt wavy boundary.
IIC—42 to 60 inches; dark grayish brown (10YR 4/2); stratified sand and gravel; medium acid.

Solum thickness ranges from 15 to 45 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 15 percent in the surface layer, from 0 to 20 percent in the subsoil, and from 10 to 45 percent below a depth of 40 inches in the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Texture is silt loam or loam. Reaction ranges from strongly acid to slightly acid.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Texture is fine sandy loam, very fine sandy loam, loam, or silt loam, or the gravelly analogs. Reaction ranges from medium acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. It ranges from stratified sand and gravel to sandy loam. Reaction ranges from medium acid to neutral.

Nassau series

The Nassau series consists of shallow, somewhat excessively drained, undulating to very steep soils. These soils formed in thin glacial till deposits on bedrock controlled uplands.

Nassau soils are closely associated with Bath soils. They are shallower over rock than Bath soils. They are also shallower than the nearby moderately well drained Mardin soils and somewhat poorly drained Erie soils. Nassau soils are similar to Farmington soils but have a higher content of coarse fragments and overlie shale bedrock instead of limestone.

Typical pedon of Nassau shaly silt loam in an area of Rock outcrop-Nassau complex, hilly, in an idle field in the town of New Windsor, 300 feet south of Forrester Road and 750 feet northwest of Route 207:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) shaly silt loam; weak fine granular structure; friable; many roots; 30 percent coarse fragments; slightly acid (limed); abrupt smooth boundary.
B2—10 to 18 inches; yellowish brown (10YR 5/4) very shaly silt loam; weak fine subangular blocky structure; friable; common roots; 60 percent coarse fragments; strongly acid; abrupt irregular boundary.
IIR—18 inches; hard, black tilted shale bedrock.

Solum thickness and depth to bedrock ranges from 10 to 20 inches. The content of coarse fragments by volume ranges from 15 to 40 percent in the surface layer and from 35 to 65 percent in the subsoil.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Texture is shaly or very shaly loam or silt loam. Reaction ranges from very strongly acid to strongly acid in unlimed areas.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Texture is very shaly silty loam or very shaly loam. Reaction ranges from very strongly acid to strongly acid.

Bedrock is hard or soft gray or black shale or slate.

Oakville series

The Oakville series consists of deep, well drained, nearly level to gently sloping soils. These soils formed in glaciofluvial deposits on sandy deltas and terraces.

Oakville soils are associated with the very gravely Otisville soils, gravelly Hoosic soils, and Chenango soils. Oakville soils have no gravel, whereas those soils have gravel fragments throughout.

Typical pedon of Oakville loamy fine sand, 3 to 8 percent slopes, in an idle hayfield in the town of Deerpark, 500 feet west of New York Route 209 and 50 feet north of Huguenot Estate Park:

Ap—0 to 8 inches; dark brown (10YR 3/3) loamy fine sand; weak fine granular structure, very friable; many roots; medium acid; abrupt smooth boundary.
B21—8 to 24 inches; yellowish brown (10YR 5/6) fine sand; weak fine subangular blocky structure; very friable; common roots; medium acid; clear wavy boundary.
B22—24 to 36 inches; yellowish brown (10YR 5/4) fine sand; massive; very friable; few roots; medium acid; clear wavy boundary.
C1—36 to 48 inches; brown (10YR 5/3) fine sand; single grain; loose; gray (10YR 5/1) sand spots; medium acid; clear wavy boundary.
C2—48 to 60 inches; grayish brown (2.5Y 5/2) fine and medium sand; single grain; loose; medium acid.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock is more than 5 feet. In a few pedons the content of coarse fragments by volume ranges to 3 percent in the subsoil and substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is loamy sand to loamy fine sand. Reaction ranges from medium acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. Reaction ranges from medium acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. Texture typically is fine sand, but in a few spots the lower part is medium sand. Reaction ranges from medium acid to neutral.

Otisville series

The Otisville series consists of deep, excessively drained, nearly level to steep soils. These soils formed in glaciofluvial deposits on valley terraces, outwash plains, and kames.

Otisville soils are similar to the somewhat excessively drained Hoosic soils and well drained to somewhat excessively drained Chenango soils but have a higher sand content in the subsoil than those soils. Otisville soils are also associated with Oakville soils. They have a high gravel content, whereas Oakville soils have no gravel fragments.

Typical pedon of Otisville gravelly sandy loam, 0 to 8 percent slopes, in a pasture in the town of Deerpark, 2.5 miles west-southwest of the village of Otisville and 0.35 mile northwest of railroad crossing at Cuddebackville:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly sandy loam; weak fine granular structure; very friable; many roots; 25 percent coarse fragments; very strongly acid; clear smooth boundary.

B2—6 to 22 inches; yellowish brown (10YR 5/6) gravelly loamy sand; weak very fine granular structure; very friable; few roots; 30 percent coarse fragments; very strongly acid; gradual wavy boundary.

B3—22 to 28 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; 40 percent gravel; very strongly acid; gradual wavy boundary.

C—28 to 60 inches; grayish brown (2.5Y 5/2) very gravelly sand; single grain; loose; 45 percent gravel; strongly acid.

Solum thickness ranges from 14 to 36 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 15 to 35 percent in the surface layer, from 30 to 50 percent in the subsoil, and from 35 to 60 percent in the substratum.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2. Texture is gravelly loamy sand or gravelly sandy loam. Reaction ranges from extremely acid to strongly acid.

The B horizon has hue of 7.5Y or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture ranges from loamy fine sand to sand or the gravelly or very gravelly analogs. Reaction ranges from extremely acid to strongly acid.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2. It is very gravelly sand or very gravelly loamy sand with varying degrees of stratification. Reaction ranges from strongly acid to medium acid.

Palms series

The Palms series consists of very poorly drained decomposed organic deposits overlying mineral soil, which occurs at a depth of 16 and 50 inches. These level soils formed in depresssions and bogs in lake plains, alluvial plains, and upland till plains.

Palms soils formed in the same kind of parent material as Carlisle soils. They are less than 51 inches deep over mineral soil, whereas Carlisle soils are more than 51 inches deep. Palms soils are also associated with Wayland, Middlebury, and Wallkill soils. Palms soils are organic, whereas Wayland and Middlebury soils are mineral throughout and Wallkill soils have a silty mineral soil cap over organic deposits.

Typical pedon of Palms muck in a cultivated field in the town of Wawayanda, 500 feet west of Wallkill River and 400 feet east of Gross Road:

Oa1—0 to 12 inches; black (10YR 2/1 broken face and rubbed) muck (sapric material); 10 percent fiber, less than 5 percent fiber rubbed; weak very fine granular structure; friable; 15 percent mineral material; many roots; strongly acid; clear smooth boundary.

Oa2—12 to 16 inches; very dark grayish brown (10YR 3/2 broken face) dark brown (10YR 3/3, rubbed) muck (sapric material); 10 percent fiber, less than 5 percent fiber rubbed; weak medium platy structure; friable; 15 percent mineral material; many pores; common roots; strongly acid; clear wavy boundary.

Oa3—16 to 25 inches; very dark grayish brown (10YR 3/2 broken face and rubbed) muck (sapric material); 10 percent fiber, less than 5 percent fiber rubbed; weak medium platy structure; friable, nonsticky and nonplastic; 20 percent mineral material; many pores; mildly alkaline; abrupt smooth boundary.

IICg—25 to 60 inches; bluish gray (5B 5/1) heavy silt loam; massive; sticky and plastic; strongly calcareous, moderately alkaline.

Thickness of the organic deposits typically is 20 to 42 inches but ranges from 16 to 51 inches. Depth to bedrock is more than 5 feet.

The surface layer has hue of 10YR, value of 2, and chroma of 1 or 2. Reaction ranges from strongly acid to mildly alkaline. Some pedons contain varying proportions of sapric and hemic materials.

The organic subsurface layers are neutral or have hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 0 to 3. The material is dominantly sapric, but in places it is hemic material less than 10 inches thick. Reaction ranges from strongly acid to moderately alkaline. In some profiles the lower part of the organic material is calcareous.

The mineral soil, the C horizon, is neutral of has hue of 10YR to 5B, value of 4 or 5, and chroma of 0 to 2. Texture ranges from fine sandy loam to silty clay loam. Reaction ranges from slightly acid to moderately alkaline. In some pedons the C horizon is calcareous.

Paxton series

The Paxton series consists of deep, well drained, sloping to moderately steep soils. These soils formed in glacial till deposits on mountainous uplands in the Palisade Park area of Orange County.

Paxton soils formed in parent material similar to that of the well drained Charlton soils. They have a fragipan, whereas Charlton soils do not have a pan. Paxton soils are also associated with Hollis and Mardin soils. They are deeper over bedrock than Hollis soils and more sandy than the silty Mardin soils.

Typical pedon of Paxton gravelly loam in an area of Charlton-Paxton complex, extremely stony, moderately steep, in a wooded area in the town of Tuxedo, 300 feet east of Ramapo River and one-fourth mile south of New York 1-87 underpass:

O1—4 to 3 inches; light brown decomposed leaf mat and sticks; clear smooth boundary.
O2—3 to 0 inches; very dark gray (10YR 3/1) highly decomposed leaf mat and sticks; weak fine granular structure; friable; strongly acid; clear smooth boundary.
A1—0 to 2 inches; dark brown (10YR 3/3) gravelly loam; weak fine granular structure; friable; many roots; 20 percent coarse fragments; strongly acid; clear smooth boundary.
B21—2 to 9 inches; strong brown (7.5YR 5/8) gravelly loam; weak medium granular structure; friable; many roots; many pores; 25 percent coarse fragments; strongly acid; clear wavy boundary.
B22—9 to 21 inches; yellowish brown (10YR 5/6) gravelly loam; weak medium granular structure; friable; common roots; common pores; 25 percent coarse fragments; strongly acid; clear wavy boundary.
Cx—21 to 60 inches; grayish brown (2.5Y 5/2) gravelly sandy loam; moderate medium platy structure; firm, brittle; 30 percent coarse fragments; strongly acid.

Solum thickness ranges from 15 to 25 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 5 to 25 percent in the solum and from 10 to 30 percent in the substratum.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 3. Texture ranges from gravelly sandy loam to loam. The surface is extremely stony. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. Texture ranges from gravelly sandy loam to loam. Reaction ranges from very strongly acid to slightly acid.

The Cx horizon has hue of 2.5Y, value of 4 to 6, and chroma of 2 or 3. Texture ranges from gravelly sandy loam to loam. Reaction ranges from very strongly acid to slightly acid. Consistence ranges from firm to very firm.

Pittsfield series

The Pittsfield series consists of deep, well drained, gently sloping to moderately steep soils. These soils formed in glacial till deposits derived from limestone and schist in uplands.

Pittsfield soils are associated with Farmington soils but are deeper over bedrock. They are similar to Bath and Mardin soils. They differ in not having a fragipan.

Typical pedon of Pittsfield gravelly loam, 3 to 8 percent slopes, in an idle field in the town of Warwick, 500 yards east of Conklin Road, 500 yards south of Bowen Road, and 50 yards north of New Jersey state line:

Ap—0 to 10 inches; very dark brown (10YR 2/2) gravelly loam; weak fine granular structure; friable; many roots; 15 percent coarse fragments; medium acid; abrupt smooth boundary.
B21—10 to 23 inches; yellowish brown (10YR 5/4) gravelly loam; weak medium subangular blocky structure; friable; common roots; 20 percent coarse fragments; medium acid; clear smooth boundary.
B22—23 to 30 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; weak medium subangular blocky structure; friable; common roots; 20 percent coarse fragments; medium acid; abrupt smooth boundary.
B23—30 to 34 inches; dark yellowish brown (10YR 4/4) gravelly fine sandy loam; weak medium subangular blocky structure; friable; common roots; 20 percent coarse fragments; medium acid; abrupt smooth boundary.
C—34 to 60 inches; brown (10YR 4/3) gravelly sandy loam; massive; very friable; few roots; 25 percent coarse fragments; medium acid.

Solum thickness ranges from 25 to 35 inches. Depth to carbonates ranges from 40 to 72 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 15 to 20 percent in the surface layer and from 5 to 25 percent in the subsoil and substratum.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is gravelly loam or gravelly fine sandy loam. Reaction ranges from very strongly acid to neutral.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture ranges from loam to sandy loam or to the gravelly analogs. Reaction ranges from strongly acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. Texture ranges from loam to sandy loam or to the gravelly analogs. Reaction ranges from medium acid to moderately alkaline.

Raynham series

The Raynham series consists of deep, somewhat poorly drained to poorly drained, nearly level soils. These soils formed in slight depressional areas in uplands and in valleys containing glaciolacustrine deposits.

Raynham soils are in a drainage sequence with the well drained Unadilla soils and moderately well drained Scio soils. They are also near and similar to Rhinebeck and Canandaigua soils but have a lower clay content than those soils.

Typical pedon of Raynham silt loam in a hayfield in the town of Wallkill, 1,000 feet northwest of County Route 18 and 500 feet north of the Post Office in Howells, New York:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many roots; neutral; abrupt smooth boundary.
B21—8 to 14 inches; light brownish gray (2.5Y 6/2) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common roots; slightly acid; abrupt smooth boundary.
B22—14 to 26 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few roots; light gray (10YR 6/1) silt coats on ped faces; neutral; clear wavy boundary.
C—26 to 60 inches; brown (10YR 4/3) silt loam; many medium distinct olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; firm; light gray (10YR 6/1) silt coats on ped faces; neutral.

Solum thickness ranges from 16 to 30 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume is generally zero but ranges to 3 percent in some pedons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Texture is silt loam, silt, or very fine sandy loam. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. Texture is silt loam, silt, or very fine sandy loam. Reaction ranges from strongly acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. Texture is silt loam, silt, or very fine sandy loam. Reaction is medium acid to mildly alkaline.

Rhinebeck series

The Rhinebeck series consists of deep, somewhat poorly drained, nearly level to gently sloping soils. These soils formed in glaciolacustrine deposits on lake plains.

Rhinebeck soils are in a drainage sequence with the poorly drained and very poorly drained Madalin soils. Rhinebeck soils are also near and similar to the somewhat poorly drained Raynham soils. They differ in having a lower content of very fine sand and a higher content of clay.

Typical pedon of Rhinebeck silt loam, 0 to 3 percent slopes, in a cornfield in the town of Crawford, 1,000 feet west of New York Route 52 and 2,000 feet east of Pine Bush Elementary School:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; many roots; neutral; abrupt smooth boundary.
B1—7 to 11 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; many roots; many pores; neutral; clear wavy boundary.
B2t—11 to 28 inches; dark grayish brown (2.5Y 4/2) heavy silty clay loam; many medium distinct yellowish brown (10YR 5/8) and common medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable, sticky and plastic; common roots; many pores; clay films on ped faces and in pores; neutral; clear wavy boundary.
B3—28 to 45 inches; dark grayish brown (2.5Y 4/2), yellowish brown (10YR 5/8), and gray (10YR 5/1) silty clay loam; moderate medium platy structure; friable, sticky and plastic; few roots; thin patchy clay films on ped faces; moderately alkaline; clear wavy boundary.
C—45 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and common fine distinct gray (10YR 5/1) mottles; moderate medium platy structure; sticky and plastic; moderately alkaline, weakly calcareous.

Solum thickness ranges from 25 to 48 inches. Depth to carbonates ranges from 25 to 60 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume is generally zero but can range up to 10 percent throughout the soil.

The A horizon has hue of 10YR; value of 3 or 4, and chroma of 2. Texture is silt loam or silty clay loam. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4. It has both high and low chroma mottles. Texture is silt loam or silty clay loam in the upper part and silty clay loam or silty clay in the lower part. Texture in the B1 horizon is similar to that in the A horizon. Reaction is strongly acid to mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It has high and low chroma mottles. Texture is silty clay loam, clay, or silty clay. Reaction is slightly acid to moderately alkaline.

Riverhead series

The Riverhead series consists of deep, well drained, nearly level to moderately steep soils. These soils formed in glaciofluvial deposits on valley terraces, kames, and outwash plains.

Riverhead soils are in a drainage sequence with the very poorly drained Scarboro soils. Riverhead soils are also near and are similar to Oakville and Otisville soils. They do not have the very high sand content in the subsoil that is typical of Oakville soils, however, nor do they have the very high gravel content that is typical of Otisville soils.

Typical pedon of Riverhead sandy loam, 3 to 8 percent slopes, in a hayfield in the town of Wallkill, 200 feet south of Rykowski Lane and 1 mile south of Crystal Run Road:

Ap—0 to 9 inches; brown (10YR 4/3) sandy loam; weak fine granular structure; friable; many roots; strongly acid; abrupt smooth boundary.
B21—9 to 16 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; friable; many roots; strongly acid; clear wavy boundary.
B22—16 to 26 inches; olive brown (2.5Y 4/4) fine sandy loam; weak fine subangular blocky structure; friable; common roots; brown root stains; strongly acid; abrupt smooth boundary.
B3—26 to 30 inches; yellowish brown (10YR 5/6) loamy sand; massive; firm; few roots; strongly acid; abrupt smooth boundary.
IIC—30 to 60 inches; olive brown (2.5Y 4/4) stratified sand and gravel; single grain; loose; 35 percent coarse fragments; neutral.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 5 percent in the surface layer, from 3 to 30 percent in the subsoil, and from 5 to 35 percent in the substratum. It is as high as 60 percent in a few layers in the substratum below 40 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is sandy loam, fine sandy loam, or loam. Reaction ranges from very strongly acid to strongly acid.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. Texture is sandy loam or fine sandy loam or the gravelly analogs. Texture of the B3 horizon ranges from loamy sand to fine sandy loam or to the gravelly analogs. Reaction in the B horizon ranges from very strongly acid to strongly acid.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is stratified sand or sand and gravel. Reaction ranges from very strongly acid to neutral.

Scarboro series

The Scarboro series consists of deep, very poorly drained, nearly level soils. These soils formed in sandy glaciofluvial deposits in depressions in outwash plains, remnant deltas, and terraces.

The Scarboro soils are in a drainage sequence with the well drained Oakville soils and well drained Riverhead soils. They are near and similar to Halsey soils but do not have the content of gravel that is typical of Halsey soils. Scarboro soils are also near Palms muck but do not have the thick organic layers that are typical of Palms soils.

Typical pedon of Scarboro mucky sandy loam in the town of Chester, one-fourth mile northeast of the junction of Erie and Lehigh Railroads and 2,000 feet west of Murray Road:

Ap—0 to 10 inches; very dark gray (10YR 3/1) mucky sandy loam; moderate fine granular structure; friable; many roots; very strongly acid; abrupt smooth boundary.
A1—10 to 11 inches; dark olive gray (5Y 3/2) mucky loamy fine sand; weak fine subangular blocky structure; friable; few roots; reddish brown (5YR 4/4) root stains; strongly acid; clear wavy boundary.
A2g—11 to 15 inches; dark gray (5Y 4/1) sand; single grain; loose; few roots; reddish brown (5YR 4/4) root stains; very strongly acid; clear wavy boundary.
C1g—15 to 40 inches; dark olive gray (5Y 3/2) coarse sand; single grain; loose; 5 percent coarse fragments; strongly acid; clear wavy boundary.
C2g—40 to 60 inches; dark gray (N 4/0) fine sand; single grain; loose; strongly acid.

Solum thickness ranges from 10 to 35 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume is usually zero but ranges up to 10 percent in subhorizons above 40 inches and up to 15 percent in individual strata below 40 inches.

The A1 or Ap horizons are neutral or have hue of 10YR, to 5Y, value of 2 or 3, and chroma of 0 to 2. Texture ranges from mucky sand to mucky fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The A2 horizon is neutral or has hue of 10YR through 5Y, value of 4 to 6, and chroma of 0 or 1. Texture ranges from loamy fine sandy to sand. Reaction is very strongly acid to medium acid.

The C horizon is neutral or has hue of 10YR to 5Y, value of 3 to 6, and chroma of 0 to 2. Texture is loamy sand, sand, of fine sand. Reaction ranges from very strongly acid to medium acid.

Scio series

The Scio series consists of deep, moderately well drained, nearly level to gently sloping soils. These soils formed in silty glaciolacustrine deposits on old alluvial fans, lake plains, and terraces and in small upland areas.

Scio soils are in a drainage sequence with the well drained Unadilla soils and somewhat poorly drained to poorly drained Raynham soils. They are also near and similar to the Collamer soils but have less clay in the subsoil.

Typical pedon of Scio silt loam, 3 to 8 percent slopes, in a cornfield in the town of Crawford, 50 feet west of Stone School House Road and 1,000 feet east of Shawangunk Kill:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many roots; slightly acid; abrupt smooth boundary.
B21—8 to 15 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; common roots; few pores; medium acid; abrupt wavy boundary.
B22—15 to 35 inches; dark yellowish brown (10YR 4/4) silt loam; few medium faint yellowish brown (10YR

5/6) and few fine distinct gray (10YR 5/1) mottles; weak very coarse prismatic structure; firm; silt films in streaks with gray (10YR 6/1) exteriors and strong brown (7.5YR 5/6) borders; 2 percent coarse fragments; medium acid; clear wavy boundary.

C—35 to 60 inches; dark brown (10YR 4/3) heavy silt loam; few faint yellowish brown (10YR 5/6) and few faint distinct gray (10YR 5/1) mottles; weak medium platy structure; friable; 2 percent coarse fragments; neutral.

Solum thickness ranges from 20 to 36 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 3 percent above a depth of 40 inches and from 5 to 60 percent below 40 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is silt loam or very fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture is silt loam or very fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It is silt loam to stratified very gravelly sand. Reaction ranges from strongly acid to mildly alkaline.

Suncook series

The Suncook series consists of deep, excessively drained, nearly level soils. These soils formed in alluvial deposits on flood plains and stream terraces along large rivers.

Suncook soils are closely associated with the well drained Tioga soils, moderately well drained to somewhat poorly drained Middlebury soils, and poorly drained and very poorly drained Wayland soils. Suncook soils are sandy, whereas those soils are more silty.

Typical pedon of Suncook sandy loam in an idle field in the town of Goshen, 100 feet east of Wallkill River and 500 yards west of intersection of Wallkill River and Echo Lake Road:

Ap—0 to 4 inches; very dark gray (10YR 3/1) sandy loam; weak fine granular structure; friable; few roots; slightly acid; abrupt smooth boundary.

C1—4 to 8 inches; dark grayish brown (10YR 4/2) loamy fine sand; single grain; loose; few roots; slightly acid; abrupt smooth boundary.

C2—8 to 37 inches, very dark gray (10YR 3/1) fine sand; single grain; loose; few roots; slightly acid; abrupt smooth boundary.

IIC3—37 to 60 inches; mixed stratified sand; single grain; loose; slightly acid.

Solum thickness ranges from 4 to 16 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 10 percent throughout the soil and to 40 percent in a few subhorizons below 40 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. Texture is sandy loam, loamy fine sand, or loamy sand. Reaction ranges from very strongly acid to slightly acid.

The C horizon has hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 or 2. It is fine, medium, or coarse sand or loamy sand that is commonly stratified. Reaction ranges from very strongly acid to slightly acid.

Swartswood series

The Swartswood series consists of deep, well drained to moderately well drained, gently sloping to very steep soils. These soils formed in glacial till deposits and have a fragipan.

Swartswood soils are in a drainage sequence with the moderately well drained to somewhat poorly drained Wurtsboro soils. They are also associated with the Arnot soils but are deeper over bedrock. Swartswood soils are similar to the well drained Bath soils and moderately well drained Mardin soils. They differ in having a lower silt content and higher sand content.

Typical pedon of Swartswood gravelly loam, 8 to 15 percent slopes, in a wooded area in the town of Deerpark, 25 feet south of Prospect Hill Road and 500 feet east of Big Pond Road:

A1—0 to 1 inch; very dark grayish brown (10YR 3/2) gravelly loam; moderate fine granular structure; friable; many roots; 20 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B21—1 to 19 inches; strong brown (7.5YR 5/4) gravelly loam; weak fine subangular blocky structure; friable; many roots; common pores; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B22—19 to 27 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; moderate medium subangular blocky structure; friable; common roots; common pores; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B23—27 to 31 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; few roots; few pores; 20 percent coarse fragments; strongly acid; abrupt wavy boundary.

Bx—31 to 62 inches; brown (10YR 5/3) gravelly fine sandy loam; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm, brittle; light gray (2.5Y 7/2) prism faces and yellowish red (5YR 4/6) borders; common pores; few thin clay films in pores; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

C—62 to 70 inches; brown (10YR 5/3) gravelly fine sandy loam; massive; firm, brittle; 20 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 65 inches. Depth to bedrock is more than 5 feet. Depth to the fragipan ranges from 25 to 35 inches. The content of coarse fragments by volume ranges from 15 to 35 percent in the surface layer and upper part of the subsoil and from 15 to 55 percent in the fragipan and substratum.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Texture is dominantly gravelly loam but also includes sandy loam or fine sandy loam and the gravelly, channery, or flaggy analogs. Reaction ranges from extremely acid to strongly acid.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture is loam, fine sandy loam, or sandy loam and the gravelly, channery, or flaggy analogs. Reaction ranges from extremely acid to strongly acid.

The Bx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Texture is gravelly, very gravelly, flaggy, or channery loam, fine sandy loam, or sandy loam. Reaction ranges from extremely acid to strongly acid.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Texture is gravelly, very gravelly, flaggy, or channery sandy loam, fine sandy loam, or loam. Reaction ranges from extremely acid to strongly acid.

Tioga series

The Tioga series consists of deep, well drained, nearly level soils. These soils formed in alluvial deposits on flood plains and low terraces along streams and rivers.

Tioga soils are in a drainage sequence with the moderately well drained to somewhat poorly drained Middlebury soils and poorly drained and very poorly drained Wayland soils. Tioga soils are similar to Barbour soils but are not so red. Tioga soils are also similar to Suncook soils but are more silty and less sandy.

Typical pedon of Tioga silt loam in a hayfield in the town of Blooming Grove, 10 feet south of Moodna Creek and 250 feet east of New York Route 208:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B2—3 to 25 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common roots; strongly acid; clear wavy boundary.

C1—25 to 40 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct gray (10YR 5/1) mottles; weak medium granular structure; friable; few roots; medium acid; clear wavy boundary.

IIC2—40 to 60 inches; dark brown (10YR 4/3) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) and common medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable; slightly acid.

Solum thickness ranges from 18 to 36 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 0 to 2 percent in the surface layer, from 0 to 35 percent in the subsoil, and from 0 to 55 percent in the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is silt loam, fine sandy loam, or loam. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. Texture is silt loam, loam, or fine sandy loam, or with the gravelly analogs. Reaction ranges from strongly acid to neutral.

The upper part of the C horizon has texture similar to that in the B horizon.

The IIC horizon has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture is dominantly fine sandy loam, but in some profiles it is silt loam, sandy loam, loam, or loamy sand or the gravelly or very gravelly analogs. Reaction is medium acid to mildly alkaline.

Udifluvents

The Udifluvents in Orange County are deep, moderately well drained and well drained soils that formed in recent alluvial deposits. They have little or no profile development. They are adjacent to streams that flood frequently.

Udifluvents are mapped with Fluvaquents. They are near Tioga, Middlebury, Wayland, Barbour, and Basher soils but are in areas where the adjacent stream, through scouring, cutting, and lateral erosion, frequently shifts the soil from place to place.

Because Udifluvents are highly variable, no typical pedon is provided. The solum is the A horizon, which is 1 to 5 inches thick. Depth to bedrock is generally more than 5 feet. The content of coarse fragments, including pebbles, cobblestones, and flagstones, ranges from 0 to 80 percent by volume. Reaction ranges from very strongly acid to mildly alkaline. Organic matter content decreases irregularly with increasing depth.

The A horizon has hue of 5YR to 5Y, value of 3 to 5, and chroma of 1 to 3. Texture ranges from fine sand to silty clay loam or to the channery, gravelly, or very gravelly analogs.

The C horizon has hue of 5YR to 5Y, value of 3 to 7, and chroma of 2 to 6. It is generally not mottled. Texture ranges from sand to silty clay loam or to the gravelly, channery, cobbly, or very gravelly analogs. Consistence is friable or loose.

Udorthents

The Udorthents in Orange County are excessively drained to moderately well drained soils that formed in

manmade cut and fill areas. They commonly occur near construction sites or urban development. They have little profile development. Depth to bedrock and soil texture are highly variable.

Because of the variability of Udorthents, a typical pedon is not provided. The solum is the A horizon, which is 1 to 8 inches thick. Depth to bedrock is generally more than 5 feet. The content of coarse fragments, including pebbles and cobblestones, ranges from 0 to 70 percent by volume in individual subhorizons. Reaction ranges from very strongly acid to moderately alkaline.

The A horizon dominantly has hue of 7.5YR through 5Y, value of 2 through 5, and chroma of 0 to 4. Texture ranges from loamy fine sand to silty clay loam or to the gravelly or very gravelly analogs.

The C horizon is neutral or has hue of 5YR to 5Y, value of 2 to 6, and chroma of 0 to 6. Texture ranges from loamy fine sand to silty clay or to the gravelly, cobbly, or very gravelly analogs. Structure, if any, is very weak. Consistence is friable to very firm, depending on the degree of soil compaction and the soil texture.

Unadilla series

The Unadilla series consists of deep, well drained, nearly level to sloping soils. These soils formed in silty glaciolacustrine deposits on lake plains, in valleys, and in a few upland areas.

Unadilla soils are in a drainage sequence with the moderately well drained Scio soils and somewhat poorly drained to poorly drained Raynham soils. They are similar to Collamer soils but have a lower clay content in the subsoil.

Typical pedon of Unadilla silt loam, 0 to 8 percent slopes, in an idle field in the town of Montgomery, 100 feet south of the Wallkill River and 150 feet south of the north-south runway of the Orange County Airport off West Kaisertown Road:

Ap—0 to 8 inches; brown (10YR 3/3) silt loam; weak fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B21—8 to 14 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common roots; common pores; strongly acid; gradual wavy boundary.

B22—14 to 28 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; firm; few roots; few pores; very strongly acid; clear wavy boundary.

B23—28 to 44 inches; light olive brown (2.5Y 5/4) very fine sandy loam; weak medium subangular blocky structure; friable; few roots; few pores; strongly acid; abrupt smooth boundary.

IIC—44 to 60 inches; dark grayish brown (2.5Y 4/2) stratified very gravelly sand; single grain; loose; medium acid.

Solum thickness ranges from 24 to 48 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume is generally zero in the solum but can range up to 2 percent; in the substratum it ranges from 2 to 10 percent above a depth of 40 inches and to as much as 60 percent below 40 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 3. Texture is silt loam or very fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The B horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam or very fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The C horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 or 3. It is loamy sand to stratified, very gravelly sand. Reaction ranges from strongly acid to mildly alkaline.

Wallkill series

The Wallkill series consists of deep, very poorly drained, nearly level soils. These soils formed in alluvial sediment over decomposed organic deposits. They occur on flood plains along streams and at the margin of mucklands.

Wallkill soils are near the very poorly drained Wayland, Palms, and Carlisle soils. Wallkill soils have an 18-inch mantle of mineral material over organic deposits. Wayland soils are mineral throughout. Palms and Carlisle soils are organic throughout.

Typical pedon of Wallkill silt loam in a cultivated field in the town of Warwick, 150 feet south of Glenswood Road and one-half mile south of Pine Island Village near Pochuck Creek:

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam; moderate fine granular structure; friable; many roots; neutral; abrupt clear boundary.

Bg—9 to 18 inches; grayish brown (10YR 4/2) silt loam; common few fine distinct yellowish red (5YR 4/8) mottles; weak fine subangular blocky structure; friable; few roots; slightly acid; abrupt smooth boundary.

IIOa—18 to 60 inches; black (10YR 2/2) broken face and rubbed) muck (sapric material), 30 percent fiber unrubbed; 10 percent fiber rubbed; massive; friable; slightly acid.

Solum thickness ranges from 16 to 40 inches. Depth of mineral soil over organic material is 16 to 40 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments is generally zero in the mineral soil material but in some pedons ranges to 5 percent by volume in the surface layer and to 20 percent in the subsoil.

The A horizon has hue of 10YR, value of 2 or 4, and chroma of 1 or 2. Texture is silt loam or fine sandy loam. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Texture is loam or silt loam or the gravelly analogs. Reaction ranges from strongly acid to neutral.

The O horizon is neutral or has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 0 to 2. It is sapric or hemic material derived from either woody or herbaceous plant material or from both. Reaction ranges from medium acid to neutral.

Wayland series

The Wayland series consists of deep, poorly drained and very poorly drained, nearly level soils. These soils formed in recent alluvial deposits on flood plains along streams and rivers.

Wayland soils are in a drainage sequence with the well drained Tioga soils and moderately well drained to somewhat poorly drained Middlebury soils. Wayland soils are near Wallkill soils. They are mineral throughout, whereas Walkill soils are underlain by organic deposits.

Typical pedon of Wayland silt loam, in a pasture in the town of Crawford, east of Dwaarkill, three-eighths of a mile north of County Route 17 and 1 mile east of Ward Avenue:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many roots; medium acid; clear wavy boundary.

B2—9 to 17 inches; dark gray (10YR 4/1) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate fine granular structure; friable; common roots; medium acid; clear smooth boundary.

C1g—17 to 35 inches; olive gray (5Y 5/2) silt loam; common distinct gray (5Y 6/1) and common medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few roots; common pores; medium acid; gradual smooth boundary.

C2g—35 to 47 inches; light olive gray (5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) and common medium prominent yellowish brown (10YR 5/6) and common medium faint gray (5Y 6/1) mottles; weak medium subangular blocky structure; friable; few roots; common pores; medium acid; clear smooth boundary.

C3g—47 to 60 inches; gray (10YR 5/1) fine sandy loam; common coarse distinct strong brown (7.5YR 5/6) mottles; massive; friable; few roots; medium acid.

Solum thickness ranges from 9 to 36 inches. Thickness of silty material over contrasting coarser material ranges from 36 to more than 60 inches. Depth to bedrock is more than 5 feet. There are generally no coarse fragments in the solum and upper part of the substratum, but the content ranges to 3 percent by volume in some pedons. The substratum below 40 inches is as much as 30 percent coarse fragments.

The A horizon is neutral or has hue of 10YR, value of 2 or 3, and chroma of 0 to 2. Texture is silt loam or silty clay loam. Reaction ranges from strongly acid to mildly alkaline.

The B horizon is neutral or has hue of 10YR to 2.5Y, value of 3 to 5, and chroma of 0 to 2. Texture is silt loam or silty clay loam. Reaction ranges from strongly acid to moderately alkaline.

The C horizon is neutral or has hue of 10YR to 5Y, value of 4 or 6, and chroma of 0 to 2. Texture to a depth of at least 36 inches is silt loam or silty clay loam. In the lower part of the C horizon it is very fine sandy loam, fine sandy loam or silt loam, or the gravelly analogs. This horizon is stratified in some pedons. Reaction is medium acid to moderately alkaline. In some pedons the soil is calcareous.

Wurtsboro series

The Wurtsboro series consists of deep, moderately well drained to somewhat poorly drained, gently sloping to sloping soils. These soils formed in glacial till deposits. They have a fragipan.

Wurtsboro soils are in a drainage sequence with the well drained and moderately well drained Swartswood soils. Wurtsboro soils are also associated with Arnot and Lordstown soils. They are similar to those soils in texture but are deeper over bedrock and have a fragipan. Wurtsboro soils are also similar to the moderately well drained Mardin soils but have a higher sand content and a lower silt content in the subsoil.

Typical pedon of Wurtsboro gravelly loam, 3 to 8 percent slopes, in a wooded area in the town of Deerpark, 30 feet north of Prospect Hill Road and 100 feet east of Big Pond Road:

A1—0 to 1 inch; brown (10YR 4/3) gravelly loam; moderate fine granular structure; very friable; many roots; 15 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21—1 to 9 inches; strong brown (7.5YR 5/6) gravelly loam; moderate medium subangular blocky structure; friable; common roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B22—9 to 20 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; common roots; 10 percent coarse fragments; strongly acid; clear wavy boundary.

A'2—20 to 23 inches; light brownish gray (2.5Y 6/2) gravelly fine sandy loam; few medium distinct brownish yellow (10YR 6/8) and few fine faint light olive gray (5Y 6/2) mottles; weak medium subangular blocky structure; firm; 25 percent coarse fragments; strongly acid; abrupt irregular boundary.

B'x—23 to 60 inches; light olive brown (2.5Y 5/4) gravelly loam; moderate very coarse prismatic structure;

very firm, very brittle; prism faces gray (10YR 5/1) with strong brown borders; 25 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 65 inches. Depth to the fragipan ranges from 18 to 25 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments by volume ranges from 15 to 25 percent in the surface layer, from 5 to 30 percent in the subsoil above the fragipan, and from 5 to 35 percent in the pan.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is loam, fine sandy loam, or sandy loam, or the gravelly or channery analogs. Reaction ranges from extremely acid to strongly acid.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture is loam, fine sandy loam, or sandy loam, or the gravelly or channery analogs. Reaction ranges from extremely acid to strongly acid.

The A'2 horizon has hue of 10YR or 2.5Y, value of 4 to 6 ,and chroma of 1 or 2. Texture is similar to that in the B horizon.

The Bx horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 4 to 6. Texture is loam, fine sandy loam, or sandy loam, or the gravelly or channery analogs. Reaction ranges from extremely acid to strongly acid. Consistence is firm or very firm.

Formation of the soils

The first part of this section describes the factors of soil formation and relates them to the formation of soils in the survey area. The second part defines the processes of soil horizon development as they relate to soil formation in Orange County.

Factors of soil formation

Soils are products of weathering and other processes that act on parent material. The properties of the soil at any point on the earth depend on the combined effects of the following factors at that point: the physical and chemical composition of the parent material, climate, plant and animal life, relief, and time. The relative influence of each of these factors of soil formation differs from place to place, and each modifies the effect of the other four. For example, the effects of climate and plant and animal life are influenced by relief and by the nature of the parent material. In some places the influence of one factor is dominant.

Parent material

Parent material is the unconsolidated earthy mass in which soils form. It determines the mineral composition and contributes greatly to the chemical composition of the soil. It also influences the rate of the soil-forming processes.

Most of the soils in Orange County formed in deposits left as the result of glaciation. Glacial till is the most extensive source of parent material. Less extensive are glaciolacustrine (lake-laid) sediment and glaciofluvial (outwash) deposits. Some soils are forming in recent deposits of stream alluvium and in accumulations of organic matter.

Soils formed in glacial till deposits have a wide range of characteristics as a result of the heterogeneous mixture of rock and soil particles. Firm fragipan horizons and substrata are common in the deeper soils. Mardin, Bath, and Swartswood soils formed in deep glacial till deposits. In places the till mantle is moderately deep or shallow over bedrock. Lordstown, Arnot, and Hollis soils formed in these areas. The bedrock in Orange County is highly variable. It includes sandstone, limestone, schist, shale, and granite. The till deposits have a high component of the local bedrock.

As the glacial ice melted, enormous quantities of melt water carried and sorted soil and rock debris. This outwash material was redeposited in layers of sand and gravel on outwash plains, terraces, kames, eskers, and deltas. Examples of soils formed in this material are Chenango and Hoosic soils. These soils are commonly medium textured to coarse textured.

Many of the larger valleys at one time contained glacial lakes where glacial melt water was trapped. Most of the stone-free sediment deposited in the quiet lake waters was clayey or silty. Rhinebeck, Collamer, and Raynham are examples of soils that formed in these fine textured to medium textured deposits.

In more recent times, overflowing streams have deposited fresh dark alluvial material on flood plains. Soils forming in this material are typically silty or sandy and show only weak profile development. Tioga and Barbour soils are examples.

Soils formed in organic deposits occupying low areas are identified as "muck." Carlisle and Palms soils formed in the well decomposed remains of trees and other plants. Some organic pockets in the main valleys have a cover of alluvium. Wallkill soils are in these areas.

Topography

The shape of the land surface, commonly called the lay of the land, the slope, and the position of the land surface as related to the water table have had great influence on the formation of soils.

In convex sloping areas where little runoff accumulates or where runoff is moderate or rapid, the soils generally are well drained and have a bright colored unmottled subsoil. They are generally leached to greater depths than low-lying wetter soils in the same general area.

In more gently sloping areas where runoff is slower, some wetness is evident such as mottling in the subsoil.

In level areas or slight depressions where the water table is at or near the surface for long periods, a marked

degree of wetness is evident a thick dark colored organic surface layer and a strongly mottled or grayish subsoil.

Some soils are wet because they occupy a position where water accumulates and is perched above an impervious layer in the soil. Permeability of the soil material, as well as the length, steepness, and configuration of slopes influences the kind of soil that forms.

Local differences in soils are largely the result of differences in parent material and topography. Table 20 shows the relationship between the soils, by soil series, and their landscape position, parent material, and drainage.

Climate

Climate, particularly temperature and precipitation, is one of the most influential of the soil-forming factors. It largely determines the kind of weathering processes that occur. It also affects the growth and kind of plants and the leaching and translocation of weathered material.

Orange County has a humid, temperate climate that tends to promote the development of moderately weathered, leached soils. Although the average temperature increases slightly in lowland areas and on south-facing slopes, the variability of the climate in the county is not great enough to cause major differences among the soils. For more detailed information on climate, see "General nature of the county."

Plant and animal life

All living organisms, including plants, animals, bacteria, and fungi, are important to soil formation. Vegetation is generally responsible for the amount of organic matter and nutrients in the soil and for the color and structure of the surface layer. Animals, such as earthworms and burrowing animals, help to keep the soil porous and permeable to air and water. Their waste products cause aggregations of soil particles and improve soil structure. Bacteria and fungi decompose vegetation, thus releasing nutrients for plant use.

Orange County was originally under native forest of northern hardwoods and pines in varying proportions. Hardwoods retard the loss of nutrients through leaching. They take up large quantities of bases, or nutrients, and return much of this material as leaf litter to the soil surface each year. In contrast, pines and other conifers do not use large amounts of nutrients. Therefore, they do not retard the leaching process as do hardwoods.

The shallow root zone in many of the soils results in a succession of windthrows that mixes the soil material.

Man also influences changes that occur in soils by clearing trees, cultivating the land, adding nutrients through fertilizers, mixing some soil horizons by plowing, and accelerating erosion in many areas.

Time

Time is a passive but important soil-forming factor. In geological terms, the deposits in which soils formed in Orange County are relatively young. Most of the material was left after the last glacier retreated 10,000 to 15,000 years ago. All the soils, however, have not reached the same stage of profile development because age is not the only influence on development. Collamer and Pittsfield soils, for example, appear to be younger than Bath and Chenango soils because they formed in different kinds of parent material. All have well-defined horizons. An immature soil does not have distinct horizons. Tioga and Wayland soils, for example, which are forming in alluvial sediment on flood plains, are immature because of the periodic deposition of fresh alluvium.

Processes of soil formation

The soil-forming factors, previously defined, and the subsequent processes of soil formation result in the formation of different layers, or soil horizons. These horizons are apparent in a vertical cut known as a soil profile. The profile extends from the surface downward into material that is little altered by soil-forming processes. Most soils contain three major horizons, the A, the B, and the C (*9*).

Several processes are involved in the formation of soil horizons—the accumulation of organic matter, leaching of soluble salts and minerals, translocation of silicate clay minerals, reduction and transfer of iron, and formation of compact layers in the subsoil.

Organic matter accumulates as plant residue decomposes. This process darkens the surface layer and helps to form the A1 horizon. The surface layer of soils in Orange County is about 3.5 percent organic matter.

For the development of distinct subsoil horizons, some of the lime and other soluble salts must be leached so that other processes, such as translocation of clay minerals, can take place. Factors that affect leaching are the kinds of salts originally present, the rate and depth of percolation, and the texture of the soil.

One of the most important processes of soil horizon development in some of the Orange County soils is the translocation of silicate clay minerals. The content of clay minerals in a soil is determined by the parent material, but clay content varies from one horizon to another. Clay particles are eluviated downward from the A horizon and redeposited (illuviated) in the B horizon as clay films on ped faces, as linings along pores and root channels, and as coatings on some coarse fragments. The Collamer soil is an example of a soil in which the clay content is higher in the B horizon than in the A horizon because of translocation. In some soils an A2 horizon has formed by considerable eluviation of clay minerals to the B horizon.

Reduction and transfer of iron compounds occur mainly in the wetter, more poorly drained soils. This process is known as gleying. In poorly drained and very poorly drained soils, such as Alden and Madalin, the grayish subsoil indicates the reduction and the removal and transfer of iron in solution. In moderately well

drained to somewhat poorly drained soils, yellowish brown and reddish brown mottles indicate the segregation of iron compounds.

Several well drained and moderately well drained soils in the county have strong brown, yellowish brown, or reddish brown subsoil horizons. These colors are mainly caused by thin coatings of iron oxides on sand and silt particles. A bright colored subsoil with iron oxide coatings is commonly termed a color B horizon. It has normally developed subangular blocky structure but contains little or no clay translocated from the overlying surface horizon. Chenango and Pittsfield soils are examples of soils that have a color B horizon.

Many soils in Orange County, for example, Erie, Mardin, and Swartswood, have a distinct fragipan in the subsoil. These horizons are very firm and brittle when moist and very hard when dry. The genesis of these horizons is not fully understood. Studies (*7*) indicate that the swelling and shrinking that takes place in alternating wet and dry periods may account for the dense packing of soil particles, the low pore space, and the gross polygonal pattern of vertical cracks evident in most fragipans. Clay, silica, and oxides of aluminum, the most likely cementing agents, cause brittleness and hardness.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	<2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	>5.2

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium car-

bonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. Mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock. Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flooding. The temporary covering of soil with water from overflowing streams, runoff and adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. None means that flooding is not probable; rare that it is unlikely but possible under unusual weather conditions; occasional that it occurs on an average of once or less in 2 years; and frequent that it occurs on an average of more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and

having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon. B horizons are commonly illuvial horizons.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are none, very slow, slow, medium, rapid, and very rapid.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. An area dominated by low relief that formed at the bottom of a glacial lake during part of the glacial period.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil and support little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (In tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, differences in slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (In tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (In tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 10 inches (25 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each

grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by melt water streams, in a glacial lake or other body of still water in front of a glacier.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.
Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.
Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.
Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature[1]						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	35.2	19.2	27.2	58	-4	10	3.17	1.66	4.39	7	9.9
February	38.4	20.5	29.5	61	-4	10	3.44	2.33	4.45	6	11.4
March	47.1	28.7	37.9	74	9	63	4.25	2.78	5.57	8	10.1
April	61.2	39.2	50.2	87	24	312	4.25	2.78	5.58	8	1.4
May	71.9	48.9	60.4	93	34	632	3.94	2.20	5.34	8	.0
June	81.5	58.5	70.0	98	45	900	3.92	2.10	5.41	7	.0
July	86.3	63.5	74.9	99	51	1,082	3.71	2.26	5.00	7	.0
August	84.2	61.9	73.1	96	49	1,026	4.16	1.94	5.96	6	.0
September	76.2	55.4	65.8	95	37	774	4.10	2.34	5.53	6	.0
October	65.0	44.9	55.0	84	27	465	4.04	1.66	5.96	5	.0
November	51.0	35.1	43.1	72	18	132	4.54	2.96	5.97	8	1.2
December	38.6	24.4	31.5	61	4	34	4.49	2.57	6.04	7	8.5
Year	61.4	41.7	51.6	101	-6	5,440	48.01	41.18	54.56	83	42.5

[1]Recorded in the period 1951-74 at West Point, N.Y.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 7	April 15	April 30
2 years in 10 later than--	April 3	April 12	April 26
5 years in 10 later than--	March 25	April 5	April 18
First freezing temperature in fall:			
1 year in 10 earlier than--	November 4	October 23	October 7
2 years in 10 earlier than--	November 9	October 28	October 13
5 years in 10 earlier than--	November 18	November 7	October 24

[1]Recorded in the period 1951-74 at West Point, N.Y.

TABLE 3.--GROWING SEASON

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	215	197	169
8 years in 10	223	203	175
5 years in 10	237	215	188
2 years in 10	252	226	201
1 year in 10	260	233	208

[1]Recorded in the period 1951-74 at West Point, N.Y.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ab	Alden silt loam	10,445	2.0
AC	Alden extremely stony soils	6,408	1.2
AdA	Allard silt loam, 0 to 3 percent slopes	190	*
AdB	Allard silt loam, 3 to 8 percent slopes	940	0.2
ANC	Arnot-Lordstown complex, sloping	9,953	1.9
AND	Arnot-Lordstown complex, moderately steep	4,614	0.9
ANF	Arnot-Lordstown complex, very steep	1,243	0.2
Ba	Barbour fine sandy loam	1,101	0.2
Be	Basher fine sandy loam	738	0.1
BnB	Bath-Nassau shaly silt loams, 3 to 8 percent slopes	15,416	2.9
BnC	Bath-Nassau shaly silt loams, 8 to 15 percent slopes	12,813	2.4
Ca	Canandaigua silt loam	10,975	2.1
Cd	Carlisle muck	1,677	0.3
Ce	Carlisle muck, very deep	7,802	1.5
Cf	Carlisle muck, ponded	702	0.1
CgA	Castile gravelly silt loam, 0 to 3 percent slopes	280	0.1
CgB	Castile gravelly silt loam, 3 to 8 percent slopes	654	0.1
ChB	Charlton fine sandy loam, 3 to 8 percent slopes	405	0.1
ChC	Charlton fine sandy loam, 8 to 15 percent slopes	225	*
CLC	Charlton-Paxton complex, extremely stony, sloping	2,504	0.5
CLD	Charlton-Paxton complex, extremely stony, moderately steep	787	0.1
CnA	Chenango gravelly silt loam, 0 to 3 percent slopes	604	0.1
CnB	Chenango gravelly silt loam, 3 to 8 percent slopes	4,342	0.8
CnC	Chenango gravelly silt loam, 8 to 15 percent slopes	737	0.1
CoB	Collamer silt loam, 3 to 8 percent slopes	466	0.1
CoC	Collamer silt loam, 8 to 15 percent slopes	122	*
CoD	Collamer silt loam, 15 to 25 percent slopes	144	*
Du	Dumps	405	0.1
ErA	Erie gravelly silt loam, 0 to 3 percent slopes	10,361	2.0
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	22,570	4.3
ESB	Erie extremely stony soils, gently sloping	17,764	3.3
FAC	Farmington silt loam, sloping	3,052	0.6
Fd	Fredon loam	2,737	0.5
Ha	Halsey silt loam	817	0.2
HH	Histic Humaquepts, ponded	2,551	0.5
HLC	Hollis soils, sloping	11,766	2.2
HLD	Hollis soils, moderately steep	4,805	0.9
HoA	Hoosic gravelly sandy loam, 0 to 3 percent slopes	864	0.2
HoB	Hoosic gravelly sandy loam, 3 to 8 percent slopes	8,236	1.6
HoC	Hoosic gravelly sandy loam, 8 to 15 percent slopes	3,612	0.7
HoD	Hoosic gravelly sandy loam, 15 to 25 percent slopes	1,991	0.4
LdB	Lordstown channery silt loam, 3 to 8 percent slopes	204	*
LdC	Lordstown channery silt loam, 8 to 15 percent slopes	172	*
Ma	Madalin silt loam	9,396	1.8
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	62,620	11.8
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	41,670	7.9
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	8,088	1.5
MNE	Mardin soils, steep	1,401	0.3
My	Middlebury silt loam	2,821	0.5
NaD	Nassau shaly silt loam, 15 to 25 percent slopes	3,597	0.7
OkA	Oakville loamy fine sand, 0 to 3 percent slopes	200	*
OkB	Oakville loamy fine sand, 3 to 8 percent slopes	1,131	0.2
OtB	Otisville gravelly sandy loam, 0 to 8 percent slopes	1,573	0.3
OtC	Otisville gravelly sandy loam, 8 to 15 percent slopes	845	0.2
OtD	Otisville gravelly sandy loam, 15 to 25 percent slopes	186	*
OVE	Otisville and Hoosic soils, steep	577	0.1
Pa	Palms muck	3,390	0.6
Pb	Palms muck, ponded	2,441	0.5
Pg	Pits, gravel	1,039	0.2
PtB	Pittsfield gravelly loam, 3 to 8 percent slopes	9,606	1.8
PtC	Pittsfield gravelly loam, 8 to 15 percent slopes	4,010	0.8
PtD	Pittsfield gravelly loam, 15 to 25 percent slopes	912	0.2
Qu	Quarries	120	*
Ra	Raynham silt loam	3,351	0.6
RbA	Rhinebeck silt loam, 0 to 3 percent slopes	1,387	0.3
RbB	Rhinebeck silt loam, 3 to 8 percent slopes	668	0.1
RhA	Riverhead sandy loam, 0 to 3 percent slopes	180	*
RhB	Riverhead sandy loam, 3 to 8 percent slopes	1,932	0.4
RhC	Riverhead sandy loam, 8 to 15 percent slopes	460	0.1
RhD	Riverhead sandy loam, 15 to 25 percent slopes	204	*

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
RKC	Rock outcrop-Arnot complex, sloping	4,941	0.9
RKD	Rock outcrop-Arnot complex, moderately steep	3,688	0.7
RKF	Rock outcrop-Arnot complex, very steep	1,938	0.4
RMC	Rock outcrop-Farmington complex, rolling	828	0.2
RMD	Rock outcrop-Farmington complex, hilly	1,097	0.2
ROC	Rock outcrop-Hollis complex, sloping	21,985	4.1
ROD	Rock outcrop-Hollis complex, moderately steep	29,705	5.7
ROF	Rock outcrop-Hollis complex, very steep	9,664	1.8
RSB	Rock outcrop-Nassau complex, undulating	8,179	1.5
RSD	Rock outcrop-Nassau complex, hilly	9,436	1.8
RSF	Rock outcrop-Nassau complex, very steep	1,190	0.2
Sb	Scarboro mucky sandy loam	687	0.1
ScA	Scio silt loam, 0 to 3 percent slopes	519	0.1
ScB	Scio silt loam, 3 to 8 percent slopes	1,228	0.2
Su	Suncook sandy loam	263	*
SwB	Swartswood gravelly loam, 3 to 8 percent slopes	2,445	0.5
SwC	Swartswood gravelly loam, 8 to 15 percent slopes	1,775	0.3
SwD	Swartswood gravelly loam, 15 to 25 percent slopes	699	0.1
SXC	Swartswood and Mardin very stony soils, sloping	36,485	6.9
SXD	Swartswood and Mardin very stony soils, moderately steep	6,428	1.2
SXF	Swartswood and Mardin very stony soils, very steep	305	0.1
Tg	Tioga silt loam	808	0.2
UF	Udifluvents-Fluvaquents complex, frequently flooded	1,733	0.3
UH	Udorthents, smoothed	5,812	1.1
UnB	Unadilla silt loam, 0 to 8 percent slopes	703	0.1
UnC	Unadilla silt loam, 8 to 15 percent slopes	209	*
Ur	Urban land	800	0.2
Wa	Wallkill silt loam	1,432	0.3
Wd	Wayland silt loam	9,134	1.7
WuB	Wurtsboro gravelly loam, 3 to 8 percent slopes	953	0.2
WuC	Wurtsboro gravelly loam, 8 to 15 percent slopes	743	0.1
	Water	12,749	2.4
	Total	530,560	100.0

* Less than 0.1 percent.

TABLE 5.--SOIL PRODUCTIVITY INDEX

Map symbol	Soil name	Index
Ab	Alden silt loam	30
AdA*	Allard silt loam, 0 to 3 percent slopes	94
AdB	Allard silt loam, 3 to 8 percent slopes	94
Ba*	Barbour fine sandy loam	94
Be*	Basher fine sandy loam	94
BnB	Bath-Nassau shaly silt loams, 3 to 8 percent slopes	85
BnC	Bath-Nassau shaly silt loams, 8 to 15 percent slopes	71
Ca	Canandaigua silt loam	42
CgA*	Castile gravelly silt loam, 0 to 3 percent slopes	68
CgB	Castile gravelly silt loam, 3 to 8 percent slopes	68
ChB	Charlton fine sandy loam, 3 to 8 percent slopes	84
ChC	Charlton fine sandy loam, 8 to 15 percent slopes	63
CnA*	Chenango gravelly silt loam, 0 to 3 percent slopes	92
CnB	Chenango gravelly silt loam, 3 to 8 percent slopes	92
CnC	Chenango gravelly silt loam, 8 to 15 percent slopes	74
CoB	Collamer silt loam, 3 to 8 percent slopes	70
CoC	Collamer silt loam, 8 to 15 percent slopes	54
CoD	Collamer silt loam, 15 to 25 percent slopes	54
ErA	Erie gravelly silt loam, 0 to 3 percent slopes	50
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	50
FAC	Farmington silt loam, sloping	58
Fd	Fredon loam	42
Ha	Halsey silt loam	36
HoA*	Hoosic gravelly sandy loam, 0 to 3 percent slopes	68
HoB	Hoosic gravelly sandy loam, 3 to 8 percent slopes	68
HoC	Hoosic gravelly sandy loam, 8 to 15 percent slopes	53
HoD	Hoosic gravelly sandy loam, 15 to 25 percent slopes	42
LdB	Lordstown channery silt loam, 3 to 8 percent slopes	62
LdC	Lordstown channery silt loam, 8 to 15 percent slopes	50
Ma	Madalin silt loam	18
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	77
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	66
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	54
My*	Middlebury silt loam	79
NaD	Nassau shaly silt loam, 15 to 25 percent slopes	42
OkA	Oakville loamy fine sand, 0 to 3 percent slopes	44
OkB	Oakville loamy fine sand, 3 to 8 percent slopes	44
OtB	Otisville gravelly sandy loam, 0 to 8 percent slopes	47
OtC	Otisville gravelly sandy loam, 8 to 15 percent slopes	47
PtB	Pittsfield gravelly loam, 3 to 8 percent slopes	89
PtC	Pittsfield gravelly loam, 8 to 15 percent slopes	70
PtD	Pittsfield gravelly loam, 15 to 25 percent slopes	54
Ra	Raynham silt loam	42
RbA	Rhinebeck silt loam, 0 to 3 percent slopes	58
RbB	Rhinebeck silt loam, 3 to 8 percent slopes	58
RhA*	Riverhead sandy loam, 0 to 3 percent slopes	76
RhB	Riverhead sandy loam, 3 to 8 percent slopes	76
RhC	Riverhead sandy loam, 8 to 15 percent slopes	60
RhD	Riverhead sandy loam, 15 to 25 percent slopes	48
ScA*	Scio silt loam, 0 to 3 percent slopes	81
ScB	Scio silt loam, 3 to 8 percent slopes	81
Su	Suncook sandy loam	44
SwB	Swartswood gravelly loam, 3 to 8 percent slopes	79
SwC	Swartswood gravelly loam, 8 to 15 percent slopes	73
Tg*	Tioga silt loam	94
UnB*	Unadilla silt loam, 0 to 8 percent slopes	100
UnC	Unadilla silt loam, 8 to 15 percent slopes	77
Wd	Wayland silt loam	30
WuB	Wurtsboro gravelly loam, 3 to 8 percent slopes	69
WuC	Wurtsboro gravelly loam, 8 to 15 percent slopes	56

* Corn for silage can be grown more than 50 percent of the time in the crop rotation system.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn silage	Corn	Alfalfa hay	Grass-legume hay	Grass hay	Pasture	Apples
	Ton	Bu	Ton	Ton	Ton	AUM*	Bu
Ab---------- Alden	---	---	---	2.5	2.0	5.0	---
AC---------- Alden	---	---	---	---	---	2.5	---
AdA---------- Allard	24	120	6.0	4.0	2.5	7.5	---
AdB---------- Allard	24	120	6.0	4.0	2.5	7.5	---
ANC---------- Arnot-Lordstown	---	---	---	---	---	4.0	---
AND---------- Arnot-Lordstown	---	---	---	---	---	3.0	---
ANF---------- Arnot-Lordstown	---	---	---	---	---	---	---
Ba---------- Barbour	24	120	6.0	4.0	2.5	7.5	---
Be---------- Basher	24	120	6.0	4.0	2.5	7.5	---
BnB---------- Bath-Nassau	20	100	6.0	4.0	2.5	7.5	400
BnC---------- Bath-Nassau	18	90	5.5	4.0	2.0	7.5	400
Ca---------- Canandaigua	10	50	---	3.0	2.0	6.0	---
Cd, Ce---------- Carlisle	---	---	---	---	---	---	---
Cf---------- Carlisle	---	---	---	---	---	---	---
CgA---------- Castile	18	90	4.0	3.0	2.0	6.0	350
CgB---------- Castile	18	90	4.0	3.0	2.0	6.0	350
ChB---------- Charlton	22	110	5.0	3.5	2.5	6.5	---
ChC---------- Charlton	20	100	4.5	3.5	2.5	6.5	---
CLC, CLD---------- Charlton-Paxton	---	---	---	---	---	2.5	---
CnA---------- Chenango	23	115	6.0	4.0	2.5	7.5	425
CnB---------- Chenango	23	115	6.0	4.0	2.5	7.5	425

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn silage	Corn	Alfalfa hay	Grass-legume hay	Grass hay	Pasture	Apples
	Ton	Bu	Ton	Ton	Ton	AUM*	Bu
CnC---- Chenango	21	105	5.5	4.0	2.5	7.5	425
CoB---- Collamer	22	110	5.0	3.5	3.0	6.5	---
CoC---- Collamer	20	100	4.5	3.5	3.0	6.5	---
CoD---- Collamer	---	---	4.5	3.0	2.5	6.0	---
Du** Dumps							
ErA---- Erie	12	60	---	3.5	2.5	6.5	---
ErB---- Erie	12	60	---	3.5	2.5	6.5	---
ESB---- Erie	---	---	---	---	---	2.0	---
FAC---- Farmington	16	80	4.0	3.5	2.5	6.5	---
Fd---- Fredon	10	---	---	3.0	2.5	6.0	200
Ha---- Halsey	---	---	---	2.5	2.0	5.0	---
HH** Histic Humaquepts							
HLC---- Hollis	---	---	---	---	---	2.5	---
HLD---- Hollis	---	---	---	---	---	2.0	---
HoA---- Hoosic	18	90	4.0	3.5	2.5	6.5	350
HoB---- Hoosic	18	90	4.0	3.5	2.5	6.5	350
HoC---- Hoosic	15	---	4.0	3.5	2.5	6.5	350
HoD---- Hoosic	---	---	3.5	3.0	2.0	6.0	---
LdB---- Lordstown	17	85	3.5	3.0	2.0	6.0	---
LdC---- Lordstown	17	85	3.5	3.0	2.0	6.0	---
Ma---- Madalin	---	---	---	1.5	1.5	3.0	---
MdB---- Mardin	18	90	5.5	4.0	3.5	7.5	350
MdC---- Mardin	16	80	5.0	4.0	3.5	7.5	350

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn silage	Corn	Alfalfa hay	Grass-legume hay	Grass hay	Pasture	Apples
	Ton	Bu	Ton	Ton	Ton	AUM*	Bu
MdD---------- Mardin	12	60	4.5	4.0	3.5	7.5	---
MNE---------- Mardin	---	---	---	---	---	2.5	---
My---------- Middlebury	20	100	5.0	4.0	3.5	7.5	---
NaD---------- Nassau	---	---	---	---	---	2.5	200
OkA, OkB---------- Oakville	12	60	2.5	2.0	2.0	4.0	---
OtB, OtC---------- Otisville	12	60	3.0	2.5	2.0	5.0	---
OtD---------- Otisville	---	---	---	---	---	2.5	---
OVE---------- Otisville and Hoosic	---	---	---	---	---	2.0	---
Pa---------- Palms	---	---	---	---	---	---	---
Pb---------- Palms	---	---	---	---	---	---	---
Pg** Pits							
PtB---------- Pittsfield	23	115	5.5	4.0	3.0	7.5	400
PtC---------- Pittsfield	22	110	5.0	4.0	3.0	7.5	400
PtD---------- Pittsfield	18	90	4.5	3.0	2.5	6.0	---
Qu**. Quarries							
Ra---------- Raynham	10	---	---	3.0	3.0	6.0	---
RbA---------- Rhinebeck	15	75	3.0	3.5	3.5	6.5	---
RbB---------- Rhinebeck	15	75	3.0	3.5	3.5	6.5	---
RhA, RhB---------- Riverhead	19	95	5.0	4.5	2.5	8.5	350
RhC---------- Riverhead	17	85	4.5	4.0	2.5	7.5	350
RhD---------- Riverhead	---	---	4.0	3.5	2.0	6.5	---
RKC---------- Rock outcrop-Arnot	---	---	---	---	---	---	---
RKD---------- Rock outcrop-Arnot	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn silage	Corn	Alfalfa hay	Grass-legume hay	Grass hay	Pasture	Apples
	Ton	Bu	Ton	Ton	Ton	AUM*	Bu
RKF---------- Rock outcrop-Arnot	---	---	---	---	---	---	---
RMC---------- Rock outcrop-Farmington	---	---	---	---	---	---	---
RMD---------- Rock outcrop-Farmington	---	---	---	---	---	---	---
ROC---------- Rock outcrop-Hollis	---	---	---	---	---	---	---
ROD---------- Rock outcrop-Hollis	---	---	---	---	---	---	---
ROF---------- Rock outcrop-Hollis	---	---	---	---	---	---	---
RSB---------- Rock outcrop-Nassau	---	---	---	---	---	---	200
RSD---------- Rock outcrop-Nassau	---	---	---	---	---	---	175
RSF---------- Rock outcrop-Nassau	---	---	---	---	---	---	---
Sb---------- Scarboro	---	---	---	---	---	2.0	---
ScA---------- Scio	22	110	4.5	3.5	3.5	6.5	300
ScB---------- Scio	22	110	4.5	3.5	3.5	6.5	350
Su---------- Suncook	12	60	2.5	2.0	2.0	4.0	---
SwB---------- Swartswood	20	100	5.0	3.5	2.5	6.5	---
SwC---------- Swartswood	19	95	4.5	3.5	2.5	6.5	---
SwD---------- Swartswood	---	---	3.5	2.5	2.0	5.0	---
SXC---------- Swartswood and Mardin	---	---	---	---	---	2.5	---
SXD---------- Swartswood and Mardin	---	---	---	---	---	2.0	---
SXF---------- Swartswood and Mardin	---	---	---	---	---	---	---
Tg---------- Tioga	24	120	6.0	4.0	3.5	7.5	---
UF---------- Udifluvents-Fluvaquents	---	---	---	---	---	3.0	---
UH**. Udorthents							
UnB---------- Unadilla	25	125	6.5	4.5	3.5	8.5	---

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn silage	Corn	Alfalfa hay	Grass-legume hay	Grass hay	Pasture	Apples
	Ton	Bu	Ton	Ton	Ton	AUM*	Bu
UnC---------- Unadilla	20	100	6.0	4.5	3.5	8.5	---
Ur**. Urban land							
Wa---------- Wallkill	---	---	---	---	---	5.0	---
Wd---------- Wayland	---	---	---	2.5	2.5	5.0	---
WuB---------- Wurtsboro	17	85	4.5	3.0	3.0	6.0	---
WuC---------- Wurtsboro	15	75	4.0	3.0	3.0	6.0	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	2,099	---	---	---
II	91,640	15,997	68,585	7,058
III	130,277	65,539	55,375	9,363
IV	88,616	49,622	31,633	7,361
V	14,697	---	14,697	---
VI	51,088	14,417	---	36,671
VII	71,949	1,243	---	70,706
VIII	59,269	---	2,551	56,718

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Ab---- Alden	5w	Slight	Severe	Severe	Severe	Red maple----	50	White spruce, northern white-cedar.
AC*---- Alden	5x	Slight	Severe	Severe	Severe	Red maple----	50	White spruce, northern white-cedar.
AdA, AdB---- Allard	3o	Slight	Slight	Slight	Slight	Sugar maple----	63	Eastern white pine,
						White ash----	76	Norway spruce,
						Northern red oak----	70	European larch,
						Black cherry----	70	red pine.
ANC*:								
Arnot----	5d	Slight	Slight	Severe	Moderate	Northern red oak----	55	Eastern white pine,
						Sugar maple----	50	red pine.
						Eastern white pine--	55	
						White ash----	55	
Lordstown----	3o	Slight	Slight	Slight	Slight	Northern red oak----	60	Eastern white pine,
						Sugar maple----	73	European larch,
						White ash----	75	red pine,
								Norway spruce.
AND*:								
Arnot----	5d	Slight	Moderate	Severe	Moderate	Northern red oak----	55	Eastern white pine,
						Sugar maple----	50	red pine.
						Eastern white pine--	55	
						White ash----	55	
Lordstown----	3r	Slight	Moderate	Slight	Slight	Northern red oak----	60	Eastern white pine,
						Sugar maple----	73	European larch,
						White ash----	75	red pine,
								Norway spruce.
ANF*:								
Arnot----	5d	Moderate	Severe	Severe	Moderate	Northern red oak----	55	Eastern white pine,
						Sugar maple----	50	red pine.
						Eastern white pine--	55	
						White ash----	55	
Lordstown----	3r	Moderate	Severe	Slight	Slight	Northern red oak----	60	Eastern white pine,
						Sugar maple----	73	European larch,
						White ash----	75	red pine,
								Norway spruce.
Ba---- Barbour	2o	Slight	Slight	Slight	Slight	Sugar maple----	70	Eastern white pine,
						Northern red oak----	80	Norway spruce,
								black walnut.
Be---- Basher	2o	Slight	Slight	Slight	Slight	Sugar maple----	70	Eastern white pine,
						Northern red oak----	80	black walnut,
						American basswood---	85	Norway spruce,
								European larch.
BnB*, BnC*:								
Bath----	3o	Slight	Slight	Slight	Slight	Northern red oak----	61	Eastern white pine,
						Black cherry----	75	red pine,
						Sugar maple----	70	Norway spruce,
								European larch.
Nassau----	5d	Slight	Slight	Severe	Moderate	Sugar maple----	50	Eastern white pine,
						Northern red oak----	50	red pine,
						Eastern white pine--	55	European larch.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Ca---------- Canandaigua	4w	Slight	Severe	Severe	Severe	Red maple---------- Eastern white pine--	65 65	Eastern white pine, white spruce.
Cd, Ce, Cf--------- Carlisle	4w	Slight	Severe	Severe	Severe	Red maple---------- White ash---------- Black cherry-------- Swamp white oak----- Silver maple--------	46 --- --- --- ---	Northern white-cedar, Austrian pine, eastern white pine.
CgA, CgB----------- Castile	3o	Slight	Slight	Slight	Slight	Sugar maple--------- Northern red oak---- Black cherry--------	63 70 70	Eastern white pine, Norway spruce, white spruce.
ChB, ChC----------- Charlton	4o	Slight	Slight	Slight	Slight	Northern red oak---- Eastern white pine-- Red pine---------- Red spruce---------- Red maple---------- Shagbark hickory----	65 65 70 50 55 ---	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
CLC*: Charlton---------- Paxton------------	4x 3x	Slight Slight	Moderate Moderate	Slight Slight	Slight Slight	Northern red oak---- Eastern white pine-- Red pine---------- Red spruce---------- Red maple---------- Shagbark hickory---- Northern red oak---- Red pine---------- Eastern white pine-- Sugar maple---------	65 65 70 50 55 --- 65 67 66 75	Eastern white pine, red pine, white spruce, eastern hemlock, European larch. Red pine, eastern white pine, Norway spruce, European larch.
CLD*: Charlton---------- Paxton------------	4x 3x	Slight Slight	Moderate Moderate	Slight Slight	Slight Slight	Northern red oak---- Eastern white pine-- Red pine---------- Red spruce---------- Red maple---------- Shagbark hickory---- Northern red oak---- Red pine---------- Eastern white pine-- Sugar maple---------	65 65 70 50 55 --- 65 67 66 75	Eastern white pine, red pine, white spruce, eastern hemlock, European larch. Red pine, eastern white pine, Norway spruce, European larch.
CnA, CnB, CnC------ Chenango	2o	Slight	Slight	Slight	Slight	Sugar maple--------- Northern red oak----	70 80	Eastern white pine, red pine, European larch.
CoB---------- Collamer	2o	Slight	Slight	Slight	Slight	Sugar maple--------- Black cherry-------- White ash---------- Northern red oak---- American basswood---	70 80 75 80 75	Eastern white pine, Norway spruce, white spruce, European larch.
CoC---------- Collamer	2r	Moderate	Slight	Slight	Slight	Sugar maple--------- Black cherry-------- White ash---------- Northern red oak---- American basswood---	70 80 75 80 75	Eastern white pine, Norway spruce, white spruce, European larch.
CoD---------- Collamer	2r	Moderate	Moderate	Slight	Slight	Sugar maple--------- Black cherry-------- White ash---------- Northern red oak---- American basswood---	70 80 75 80 75	Eastern white pine, Norway spruce, white spruce, European larch.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
ErA, ErB---------- Erie	3w	Slight	Moderate	Moderate	Moderate	Sugar maple---------	64	Eastern white pine,
						Black cherry--------	65	Norway spruce,
								European larch,
								white spruce.
ESB*---------- Erie	3w	Slight	Moderate	Moderate	Moderate	Sugar maple---------	64	Eastern white pine,
						Black cherry--------	65	Norway spruce,
								European larch,
								white spruce.
FAC---------- Farmington	5d	Slight	Slight	Severe	Moderate	Sugar maple---------	50	Eastern white pine,
						Northern red oak----	50	red pine,
						Eastern white pine--	55	European larch.
Fd---------- Fredon	4w	Slight	Severe	Severe	Severe	Northern red oak----	70	Yellow-poplar,
						Yellow-poplar-------	80	eastern white pine,
						Eastern white pine--	70	white spruce,
						Red maple-----------	75	Norway spruce.
Ha---------- Halsey	5w	Slight	Severe	Severe	Severe	Red maple-----------	55	Eastern white pine,
						White oak-----------	---	white spruce.
						Swamp white oak-----	---	
						American beech------	---	
						River birch---------	---	
HLC*---------- Hollis	5d	Slight	Slight	Severe	Moderate	Northern red oak----	47	Eastern white pine,
						Eastern white pine--	55	red pine.
						Sugar maple---------	56	
						Red pine------------	47	
						White spruce--------	60	
						Red spruce----------	37	
HLD*---------- Hollis	5d	Slight	Moderate	Severe	Moderate	Northern red oak----	47	Eastern white pine,
						Eastern white pine--	55	red pine.
						Sugar maple---------	56	
						Red pine------------	47	
						White spruce--------	60	
						Red spruce----------	37	
HoA, HoB, HoC------ Hoosic	3o	Slight	Slight	Slight	Slight	Sugar maple---------	65	Eastern white pine,
						Northern red oak----	75	red pine,
								European larch.
HoD---------- Hoosic	3r	Slight	Moderate	Slight	Slight	Sugar maple---------	65	Eastern white pine,
						Northern red oak----	75	red pine,
								European larch.
LdB, LdC---------- Lordstown	3o	Slight	Slight	Slight	Slight	Northern red oak----	60	Eastern white pine,
						Sugar maple---------	73	European larch,
						White ash-----------	75	red pine,
								Norway spruce.
Ma---------- Madalin	5w	Slight	Severe	Severe	Severe	Red maple-----------	50	Eastern white pine,
						White ash-----------	50	northern white-cedar,
								white spruce.
MdB, MdC---------- Mardin	3o	Slight	Slight	Slight	Slight	Sugar maple---------	60	Red pine,
						Northern red oak----	63	European larch,
						Black cherry--------	75	Norway spruce,
								eastern white pine.
MdD, MNE*---------- Mardin	3r	Slight	Moderate	Slight	Slight	Sugar maple---------	60	Red pine,
						Northern red oak----	63	European larch,
						Black cherry--------	75	Norway spruce,
								eastern white pine.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
My---------- Middlebury	2o	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple--------- Yellow-poplar-------	80 70 85	Eastern white pine, yellow-poplar, Norway spruce, European larch, black walnut, black cherry.
NaD---------- Nassau	5d	Slight	Moderate	Severe	Moderate	Sugar maple--------- Northern red oak---- Eastern white pine--	50 50 55	Eastern white pine, red pine, European larch.
OkA, OkB---------- Oakville	3s	Slight	Slight	Severe	Slight	White oak---------- Red pine---------- Eastern white pine-- Jack pine----------	70 78 85 68	Eastern white pine, red pine, jack pine.
OtB, OtC---------- Otisville	4s	Slight	Slight	Severe	Slight	Eastern white pine-- Northern red oak---- Sugar maple--------- White oak---------- Black oak----------	65 60 55 60 60	Eastern white pine, European larch, red pine.
OtD---------- Otisville	4s	Slight	Moderate	Severe	Slight	Eastern white pine-- Northern red oak---- Sugar maple--------- White oak---------- Black oak----------	65 60 55 60 60	Eastern white pine, European larch, red pine.
OVE*: Otisville---------	4s	Slight	Moderate	Severe	Slight	Eastern white pine-- Northern red oak---- Sugar maple--------- White oak---------- Black oak----------	65 60 55 60 60	Eastern white pine, European larch, red pine.
Hoosic----------	3r	Slight	Moderate	Slight	Slight	Sugar maple--------- Northern red oak----	65 75	Eastern white pine, red pine, European larch.
Pa, Pb---------- Palms	4w	Slight	Severe	Severe	Severe	Red maple---------- Silver maple-------- White ash---------- Quaking aspen------- Northern white-cedar Tamarack---------- Black ash----------	51 76 51 56 27 45 ---	
PtB, PtC---------- Pittsfield	3o	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple--------- Eastern white pine--	70 63 65	Eastern white pine, white spruce, Norway spruce, European larch.
PtD---------- Pittsfield	3r	Slight	Moderate	Slight	Slight	Northern red oak---- Sugar maple--------- Eastern white pine--	70 63 65	Eastern white pine, white spruce, Norway spruce, European larch.
Ra---------- Raynham	4w	Slight	Severe	Severe	Severe	Eastern white pine-- White spruce-------- Red spruce----------	65 55 45	Eastern white pine, white spruce, northern white-cedar.
RbA, RbB---------- Rhinebeck	3w	Slight	Moderate	Slight	Slight	Sugar maple--------- Northern red oak----	65 70	Eastern white pine, Norway spruce, European larch.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
RhA, RhB, RhC----- Riverhead	3o	Slight	Slight	Slight	Slight	Sugar maple--------- Northern red oak---- Black cherry-------- Eastern white pine--	63 70 70 75	Eastern white pine, Norway spruce, European larch.
RhD----------- Riverhead	3r	Slight	Moderate	Slight	Slight	Sugar maple--------- Northern red oak---- Black cherry-------- Eastern white pine--	63 70 70 75	Eastern white pine, Norway spruce, European larch.
RKC*: Rock outcrop.								
Arnot----------	5d	Slight	Slight	Severe	Moderate	Northern red oak---- Sugar maple--------- Eastern white pine-- White ash----------	55 50 55 55	Eastern white pine, red pine.
RKD*: Rock outcrop.								
Arnot----------	5d	Slight	Moderate	Severe	Moderate	Northern red oak---- Sugar maple--------- Eastern white pine-- White ash----------	55 50 55 55	Eastern white pine, red pine.
RKF*: Rock outcrop.								
Arnot----------	5d	Moderate	Severe	Severe	Moderate	Northern red oak---- Sugar maple--------- Eastern white pine-- White ash----------	55 50 55 55	Eastern white pine, red pine.
RMC*: Rock outcrop.								
Farmington--------	5d	Slight	Slight	Severe	Moderate	Sugar maple--------- Northern red oak---- Eastern white pine--	50 50 55	Eastern white pine, red pine, European larch.
RMD*: Rock outcrop.								
Farmington--------	5d	Moderate	Moderate	Severe	Moderate	Sugar maple--------- Northern red oak---- Eastern white pine--	50 50 55	Eastern white pine, red pine, European larch.
ROC*: Rock outcrop.								
Hollis----------	5d	Slight	Slight	Severe	Moderate	Northern red oak---- Eastern white pine-- Sugar maple--------- Red pine---------- White spruce-------- Red spruce----------	47 55 56 47 60 37	Eastern white pine, red pine.
ROD*: Rock outcrop.								
Hollis----------	5d	Slight	Moderate	Severe	Moderate	Northern red oak---- Eastern white pine-- Sugar maple--------- Red pine---------- White spruce-------- Red spruce----------	47 55 56 47 60 37	Eastern white pine, red pine.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
ROF*:								
Rock outcrop.								
Hollis	5d	Moderate	Severe	Severe	Moderate	Northern red oak	47	Eastern white pine, red pine.
						Eastern white pine	55	
						Sugar maple	56	
						Red pine	47	
						White spruce	60	
						Red spruce	37	
RSB*:								
Rock outcrop.								
Nassau	5d	Slight	Slight	Severe	Moderate	Sugar maple	50	Eastern white pine, red pine, European larch.
						Northern red oak	50	
						Eastern white pine	55	
RSD*:								
Rock outcrop.								
Nassau	5d	Slight	Moderate	Severe	Moderate	Sugar maple	50	Eastern white pine, red pine, European larch.
						Northern red oak	50	
						Eastern white pine	55	
RSF*:								
Rock outcrop.								
Nassau	5d	Moderate	Severe	Severe	Moderate	Sugar maple	50	Eastern white pine, red pine, European larch.
						Northern red oak	50	
						Eastern white pine	55	
Sb	5w	Slight	Severe	Severe	Severe	Eastern white pine	55	Northern white-cedar.
Scarboro						Red maple	55	
						Northern white-cedar	45	
						Black spruce	---	
						Balsam fir	45	
						European larch	---	
ScA, ScB	2o	Slight	Slight	Slight	Slight	Northern red oak	75	European larch, eastern white pine, red pine, Norway spruce, white spruce.
Scio						White ash	85	
						Sugar maple	70	
						Black cherry	80	
						Eastern hemlock	70	
						Eastern white pine	85	
Su	5s	Slight	Slight	Severe	Slight	Eastern white pine	55	Eastern white pine, red pine.
Suncook						Black oak	50	
						Northern red oak	50	
						Red maple	50	
SwB, SwC	3o	Slight	Slight	Slight	Slight	Northern red oak	70	Red pine, eastern white pine, European larch, Norway spruce.
Swartswood						Sugar maple	70	
						White ash	70	
SwD	3r	Slight	Moderate	Slight	Slight	Northern red oak	70	Red pine, eastern white pine, European larch, Norway spruce.
Swartswood						Sugar maple	70	
						White ash	70	
SXC*:								
Swartswood	3o	Slight	Slight	Slight	Slight	Northern red oak	70	Red pine, eastern white pine, European larch, Norway spruce.
						Sugar maple	70	
						White ash	70	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
SXC*:								
Mardin	3o	Slight	Slight	Slight	Slight	Sugar maple Northern red oak Black cherry	60 63 75	Red pine, European larch, Norway spruce, eastern white pine.
SXD*:								
Swartswood	3r	Slight	Moderate	Slight	Slight	Northern red oak Sugar maple White ash	70 70 70	Red pine, eastern white pine, European larch, Norway spruce.
Mardin	3r	Slight	Slight	Slight	Slight	Sugar maple Northern red oak Black cherry	60 63 75	Red pine, European larch, Norway spruce, eastern white pine.
SXF*:								
Swartswood	3r	Moderate	Severe	Slight	Slight	Northern red oak Sugar maple White ash	70 70 70	Red pine, eastern white pine, European larch.
Mardin	3r	Moderate	Severe	Slight	Slight	Sugar maple Northern red oak Black cherry	60 63 75	Red pine, European larch. Norway spruce.
Tg Tioga	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple	75 85 67	Eastern white pine, yellow-poplar, Norway spruce, black walnut, European larch.
UnB Unadilla	2o	Slight	Slight	Slight	Slight	Sugar maple Eastern white pine Northern red oak Black cherry White ash	70 85 80 80 95	Eastern white pine, Norway spruce, black cherry, European larch, red pine, white spruce.
UnC Unadilla	2r	Moderate	Slight	Slight	Slight	Sugar maple Eastern white pine Northern red oak Black cherry White ash	70 85 80 80 95	Eastern white pine, Norway spruce, black cherry, European larch, red pine, white spruce.
Wa Wallkill	4w	Slight	Severe	Severe	Severe	Pin oak Red maple	80 65	White spruce, northern white-cedar.
Wd Wayland	4w	Slight	Severe	Severe	Severe	Red maple	65	White spruce, northern white-cedar.
WuB, WuC Wurtsboro	3o	Slight	Slight	Slight	Slight	Northern red oak Sugar maple	70 70	Norway spruce, eastern white pine, red pine, black cherry, European larch.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ab Alden	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
AC* Alden	Severe: wetness, large stones.	Severe: wetness.	Severe: wetness, large stones.	Severe: wetness, large stones.	Severe: wetness, large stones.
AdA Allard	Slight	Slight	Slight	Slight	Slight.
AdB Allard	Slight	Slight	Moderate: slope.	Slight	Slight.
ANC*: Arnot	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.	Severe: depth to rock.
Lordstown	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, depth to rock, small stones.
AND*: Arnot	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: small stones, slope.	Severe: slope, depth to rock.
Lordstown	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
ANF*: Arnot	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, depth to rock.
Lordstown	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Ba Barbour	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Be Basher	Severe: floods.	Moderate: floods.	Moderate: floods, wetness.	Slight	Moderate: floods.
BnB*: Bath	Moderate: small stones, percs slowly.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
Nassau	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock.	Moderate: small stones.	Severe: depth to rock.
BnC*: Bath	Moderate: small stones, percs slowly.	Moderate: small stones, slope.	Severe: slope, small stones.	Moderate: small stones.	Moderate: small stones, slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BnC*: Nassau	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock.	Moderate: small stones.	Severe: depth to rock.
Ca Canandaigua	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Cd, Ce, Cf Carlisle	Severe: floods, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.
CgA, CgB Castile	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
ChB Charlton	Slight	Slight	Moderate: slope.	Slight	Slight.
ChC Charlton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CLC*: Charlton	Severe: large stones.	Moderate: slope, large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: large stones.
Paxton	Severe: large stones.	Moderate: large stones, slope.	Severe: slope, large stones.	Severe: large stones.	Severe: large stones.
CLD*: Charlton	Severe: large stones, slope.	Severe: slope.	Severe: slope, large stones.	Severe: large stones.	Severe: slope, large stones.
Paxton	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: large stones.	Severe: slope, large stones.
CnA, CnB Chenango	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
CnC Chenango	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, small stones.
CoB Collamer	Slight	Slight	Moderate: slope, percs slowly.	Slight	Slight.
CoC Collamer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CoD Collamer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Du*. Dumps					
ErA, ErB Erie	Moderate: wetness, percs slowly.	Moderate: wetness.	Severe: small stones, wetness.	Moderate: small stones, wetness.	Moderate: small stones, wetness.
ESB* Erie	Severe: large stones.	Moderate: wetness, large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
FAC---------- Farmington	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Slight----------	Severe: depth to rock.
Fd---------- Fredon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ha---------- Halsey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
HH* Histic Humaquepts					
HLC*---------- Hollis	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock.	Moderate: small stones.	Severe: depth to rock.
HLD*---------- Hollis	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, small stones.	Severe: slope, depth to rock.
HoA, HoB---------- Hoosic	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Severe: small stones.
HoC---------- Hoosic	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope, small stones.	Moderate: small stones.	Severe: small stones.
HoD---------- Hoosic	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: small stones, slope.	Severe: slope, small stones.
LdB---------- Lordstown	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: depth to rock, small stones.
LdC---------- Lordstown	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, depth to rock, small stones.
Ma---------- Madalin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
MdB---------- Mardin	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
MdC---------- Mardin	Moderate: percs slowly, small stones.	Moderate: small stones, slope.	Severe: slope, small stones.	Moderate: small stones.	Moderate: small stones, slope.
MdD---------- Mardin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: small stones, slope.	Severe: slope.
MNE*---------- Mardin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
My---------- Middlebury	Severe: floods.	Moderate: floods.	Moderate: floods, wetness.	Slight----------	Moderate: floods.
NaD---------- Nassau	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
OkA---- Oakville	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
OkB---- Oakville	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: too sandy.
OtB---- Otisville	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Severe: too sandy.
OtC---- Otisville	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Severe: too sandy.
OtD---- Otisville	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope, too sandy.
OVE*: Otisville----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope, too sandy.
Hoosic----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
Pa, Pb---- Palms	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.
Pg*. Pits					
PtB---- Pittsfield	Slight----	Slight----	Moderate: slope, small stones.	Slight----	Slight.
PtC---- Pittsfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----	Moderate: slope.
PtD---- Pittsfield	Severe: slope.	Severe: slope.	Severe: slope.	Moderate----	Severe: slope.
Qu*. Quarries					
Ra---- Raynham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.
RbA, RbB---- Rhinebeck	Moderate: wetness, percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RhA---- Riverhead	Slight----	Slight----	Slight----	Slight----	Slight.
RhB---- Riverhead	Slight----	Slight----	Moderate: slope.	Slight----	Slight.
RhC---- Riverhead	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----	Moderate: slope.
RhD---- Riverhead	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RKC*: Rock outcrop.					
Arnot	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.	Severe: depth to rock.
RKD*: Rock outcrop.					
Arnot	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: small stones, slope.	Severe: slope, depth to rock.
RKF*: Rock outcrop.					
Arnot	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, depth to rock.
RMC*: Rock outcrop.					
Farmington	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Slight	Severe: depth to rock.
RMD*: Rock outcrop.					
Farmington	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
ROC*: Rock outcrop.					
Hollis	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock.	Moderate: small stones.	Severe: depth to rock.
ROD*: Rock outcrop.					
Hollis	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, small stones.	Severe: slope, depth to rock.
ROF*: Rock outcrop.					
Hollis	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
RSB*: Rock outcrop.					
Nassau	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock.	Moderate: small stones.	Severe: depth to rock.
RSD*: Rock outcrop.					

See footnote at end of table.

TABLE 9.-RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RSD*:					
Nassau	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, small stones.	Severe: slope, depth to rock.
RSF*:					
Rock outcrop.					
Nassau	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Sb	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Scarboro					
ScA	Slight	Slight	Moderate: wetness.	Slight	Slight.
Scio					
ScB	Slight	Slight	Moderate: slope, wetness.	Slight	Slight.
Scio					
Su	Moderate: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Suncook					
SwB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
Swartswood					
SwC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, small stones.
Swartswood					
SwD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
Swartswood					
SXC*:					
Swartswood	Moderate: slope, large stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: large stones.	Moderate: slope, large stones.
Mardin	Moderate: slope, large stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: large stones.	Moderate: large stones, slope.
SXD*, SXF*:					
Swartswood	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Mardin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Tg	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Tioga					
UF*:					
Udifluvents.					
Fluvaquents.					
UH*.					
Udorthents					
UnB	Slight	Slight	Moderate: slope.	Slight	Slight.
Unadilla					

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UnC---------- Unadilla	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Ur*. Urban land					
Wa---------- Wallkill	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Wd---------- Wayland	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
WuB---------- Wurtsboro	Moderate: percs slowly.	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
WuC---------- Wurtsboro	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ab---------- Alden	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
AC*---------- Alden	Very poor.	Very poor.	Poor	Poor	Poor	Good	Fair	Very poor.	Poor	Fair.
AdA---------- Allard	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AdB---------- Allard	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ANC*:										
Arnot----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lordstown----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AND*:										
Arnot----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lordstown----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ANF*:										
Arnot----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lordstown----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Ba---------- Barbour	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Be---------- Basher	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BnB*:										
Bath----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Nassau----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
BnC*:										
Bath----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Nassau----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Ca---------- Canandaigua	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Cd, Ce---------- Carlisle	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Cf---------- Carlisle	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CgA---- Castile	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CgB---- Castile	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ChB---- Charlton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ChC---- Charlton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CLC*, CLD*: Charlton----	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Paxton----	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
CnA, CnB, CnC---- Chenango	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
CoB---- Collamer	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CoC---- Collamer	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CoD---- Collamer	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Du*. Dumps										
ErA---- Erie	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Fair	Poor	Fair.
ErB---- Erie	Fair	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
ESB*---- Erie	Very poor.	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
FAC---- Farmington	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Fd---- Fredon	Poor	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Good.
Ha---- Halsey	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
HH*. Histic Humaquepts										
HLC*, HLD*---- Hollis	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
HoA, HoB, HoC, HoD- Hoosic	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
LdB---- Lordstown	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LdC---- Lordstown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ma---------- Madalin	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MdB---------- Mardin	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
MdC---------- Mardin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
MdD---------- Mardin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
MNE*---------- Mardin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
My---------- Middlebury	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
NaD---------- Nassau	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
OkA, OkB---------- Oakville	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
OtB, OtC, OtD------ Otisville	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
OVE*:										
Otisville---------	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Hoosic----------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Pa, Pb---------- Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Poor.
Pg*. Pits										
PtB---------- Pittsfield	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PtC---------- Pittsfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PtD---------- Pittsfield	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Qu*. Quarries										
Ra---------- Raynham	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
RbA---------- Rhinebeck	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RbB---------- Rhinebeck	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RhA---------- Riverhead	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RhB, RhC---------- Riverhead	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
RhD---------- Riverhead	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RKC*, RKD*: Rock outcrop.										
Arnot----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RKF*: Rock outcrop.										
Arnot----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RMC*, RMD*: Rock outcrop.										
Farmington--------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
ROC*, ROD*: Rock outcrop.										
Hollis----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
ROF*: Rock outcrop.										
Hollis----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RSB*, RSD*: Rock outcrop.										
Nassau----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RSF*: Rock outcrop.										
Nassau----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Sb---------- Scarboro	Very poor.	Poor	Poor	Poor	Poor	Good	Poor	Poor	Poor	Fair.
ScA---------- Scio	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ScB---------- Scio	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Su---------- Suncook	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
SwB---------- Swartswood	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SwC---------- Swartswood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SwD---------- Swartswood	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
SXC*, SXD*: Swartswood	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Mardin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
SXF*: Swartswood.										
Mardin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Tg Tioga	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UF*: Udifluvents.										
Fluvaquents.										
UH*. Udorthents										
UnB Unadilla	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UnC Unadilla	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ur*. Urban land										
Wa Wallkill	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wd Wayland	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
WuB Wurtsboro	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
WuC Wurtsboro	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ab Alden	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
AC* Alden	Severe: wetness, large stones.	Severe: wetness, frost action.	Severe: wetness, large stones.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness, large stones.
AdA, AdB Allard	Severe: cutbanks cave.	Severe: frost action.	Slight	Severe: frost action.	Severe: frost action.	Slight.
ANC*: Arnot	Severe: depth to rock, small stones.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Lordstown	Severe: depth to rock.	Moderate: slope, depth to rock, frost action.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.	Moderate: slope, depth to rock, small stones.
AND*, ANF*: Arnot	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Lordstown	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
Ba Barbour	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Be Basher	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods, frost action.	Moderate: floods.
BnB*: Bath	Moderate: depth to rock, small stones.	Moderate: frost action.	Moderate: depth to rock, wetness.	Moderate: slope, frost action.	Moderate: frost action.	Moderate: small stones.
Nassau	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
BnC*: Bath	Moderate: slope, depth to rock, small stones.	Moderate: slope, frost action.	Moderate: slope, depth to rock, wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, slope.
Nassau	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Ca Canandaigua	Severe: wetness, cutbanks cave.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: frost action, wetness.	Severe: wetness.
Cd, Ce, Cf Carlisle	Severe: floods, wetness, excess humus.	Severe: wetness, low strength, floods.	Severe: wetness, low strength, floods.	Severe: wetness, low strength, floods.	Severe: low strength, wetness, floods.	Severe: excess humus, wetness, floods.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CgA, CgB---------- Castile	Severe: wetness, cutbanks cave.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Moderate: small stones.
ChB---------- Charlton	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
ChC---------- Charlton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
CLC*: Charlton---------	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Moderate: large stones, slope.	Severe: large stones.
Paxton----------	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Moderate: slope, large stones.	Severe: large stones.
CLD*: Charlton---------	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
Paxton----------	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
CnA---------- Chenango	Severe: small stones, cutbanks cave.	Moderate: frost action.	Slight---------	Moderate: frost action.	Moderate: frost action.	Moderate: small stones.
CnB---------- Chenango	Severe: small stones, cutbanks cave.	Moderate: frost action.	Slight---------	Moderate: slope, frost action.	Moderate: frost action.	Moderate: small stones.
CnC---------- Chenango	Severe: small stones, cutbanks cave.	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, small stones.
CoB---------- Collamer	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Slight.
CoC---------- Collamer	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: slope, frost action.	Severe: frost action.	Moderate: slope.
CoD---------- Collamer	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, frost action.	Severe: slope.
Du*. Dumps						
ErA, ErB---------- Erie	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: frost action.	Moderate: small stones, wetness.
ESB*---------- Erie	Severe: wetness, large stones.	Severe: wetness, large stones, frost action.	Severe: wetness, large stones.	Severe: wetness, frost action, large stones.	Severe: frost action.	Severe: large stones.
FAC---------- Farmington	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Fd---------- Fredon	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ha---------- Halsey	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
HH*. Histic Humaquepts						
HLC*---------- Hollis	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
HLD*---------- Hollis	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
HoA---------- Hoosic	Severe: small stones.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: small stones.
HoB---------- Hoosic	Severe: small stones.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: small stones.
HoC---------- Hoosic	Severe: small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones.
HoD---------- Hoosic	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
LdB---------- Lordstown	Severe: depth to rock.	Moderate: depth to rock, frost action.	Severe: depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: depth to rock, frost action.	Moderate: depth to rock, small stones.
LdC---------- Lordstown	Severe: depth to rock.	Moderate: slope, depth to rock, frost action.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.	Moderate: slope, depth to rock, small stones.
Ma---------- Madalin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.
MdB---------- Mardin	Severe: wetness.	Moderate: frost action, wetness.	Severe: wetness.	Moderate: slope, frost action, wetness.	Moderate: frost action.	Moderate: small stones.
MdC---------- Mardin	Severe: wetness.	Moderate: slope, frost action, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, slope.
MdD, MNE*--------- Mardin	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Severe: slope.
My---------- Middlebury	Severe: floods, wetness, cutbanks cave.	Severe: floods, frost action.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: frost action, floods.	Moderate: floods.
NaD---------- Nassau	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
OkA---------- Oakville	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: too sandy.
OkB---------- Oakville	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: too sandy.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
OtB---------- Otisville	Severe: cutbanks cave, small stones.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: too sandy.
OtC---------- Otisville	Severe: cutbanks cave, small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
OtD---------- Otisville	Severe: slope, cutbanks cave, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too sandy.
OVE*: Otisville--------	Severe: slope, cutbanks cave, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too sandy.
Hoosic----------	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Pa, Pb---------- Palms	Severe: wetness, excess humus, floods.	Severe: wetness, low strength, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, excess humus.
Pg*. Pits						
PtB---------- Pittsfield	Moderate: small stones.	Moderate: frost action.	Slight---------	Moderate: slope, frost action.	Moderate: frost action.	Slight.
PtC---------- Pittsfield	Moderate: slope, small stones.	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
PtD---------- Pittsfield	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Qu*. Quarries						
Ra---------- Raynham	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: frost action, wetness.	Moderate: wetness.
RbA, RbB---------- Rhinebeck	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: low strength.	Moderate: wetness.
RhA---------- Riverhead	Severe: cutbanks cave.	Moderate: frost action.	Slight---------	Moderate: frost action.	Moderate: frost action.	Slight.
RhB---------- Riverhead	Severe: cutbanks cave.	Moderate: frost action.	Slight---------	Moderate: slope, frost action.	Moderate: frost action.	Slight.
RhC---------- Riverhead	Severe: cutbanks cave.	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
RhD---------- Riverhead	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RKC*: Rock outcrop.						

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RKC*:						
Arnot	Severe: depth to rock, small stones.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
RKD*, RKF*:						
Rock outcrop.						
Arnot	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
RMC*:						
Rock outcrop.						
Farmington	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
RMD*:						
Rock outcrop.						
Farmington	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
ROC*:						
Rock outcrop.						
Hollis	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
ROD*, ROF*:						
Rock outcrop.						
Hollis	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
RSB*:						
Rock outcrop.						
Nassau	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
RSD*, RSF*:						
Rock outcrop.						
Nassau	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Sb	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
ScA, ScB	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Slight.
Scio						
Su	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Suncook						
SwB	Moderate: wetness.	Moderate: frost action.	Moderate: wetness.	Moderate: slope, frost action.	Moderate: frost action.	Moderate: small stones.
Swartswood						

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SwC---------- Swartswood	Moderate: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, small stones.
SwD---------- Swartswood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SXC*: Swartswood-------	Moderate: slope, wetness.	Moderate: slope, frost action, large stones.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, large stones.
Mardin----------	Severe: wetness.	Moderate: slope, large stones, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
SXD*, SXF*: Swartswood-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mardin----------	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Severe: slope.
Tg---------- Tioga	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
UF*: Udifluvents. Fluvaquents.						
UH*. Udorthents						
UnB---------- Unadilla	Slight---------	Severe: frost action.	Slight---------	Severe: frost action.	Severe: frost action.	Slight.
UnC---------- Unadilla	Moderate: slope.	Severe: frost action.	Moderate: slope.	Severe: slope, frost action.	Severe: frost action.	Moderate: slope.
Ur*. Urban land						
Wa---------- Wallkill	Severe: wetness, floods.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods.
Wd---------- Wayland	Severe: wetness, floods.	Severe: floods, wetness, frost action.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: wetness, floods, frost action.	Severe: wetness, floods.
WuB---------- Wurtsboro	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: frost action, wetness.	Slight.
WuC---------- Wurtsboro	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Moderate: slope, wetness, frost action.	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ab Alden	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
AC* Alden	Severe: wetness, percs slowly, large stones.	Moderate: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: wetness, large stones.
AdA, AdB Allard	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer, area reclaim.
ANC*: Arnot	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: small stones, thin layer.
Lordstown	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, small stones, thin layer.
AND*: Arnot	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, small stones, thin layer.
Lordstown	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope.
ANF*: Arnot	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, small stones, thin layer.
Lordstown	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
Ba Barbour	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Fair: thin layer.
Be Basher	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Good.
BnB*: Bath	Severe: percs slowly.	Moderate: slope, depth to rock.	Severe: depth to rock.	Moderate: wetness.	Fair: small stones.
Nassau	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, area reclaim.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BnC*:					
Bath	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope, wetness.	Fair: slope, small stones.
Nassau	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
Ca Canandaigua	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
Cd, Ce, Cf Carlisle	Severe: floods, wetness.	Severe: wetness, excess humus, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness, excess humus.
CgA, CgB Castile	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: small stones, thin layer.
ChB Charlton	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
ChC Charlton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
CLC*:					
Charlton	Severe: large stones.	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.
Paxton	Severe: percs slowly, large stones.	Severe: slope.	Severe: large stones.	Moderate: slope.	Poor: large stones.
CLD*:					
Charlton	Severe: slope, large stones.	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: seepage, slope.	Poor: slope, large stones.
Paxton	Severe: slope, percs slowly, large stones.	Severe: slope.	Severe: large stones.	Severe: slope.	Poor: slope, large stones.
CnA, CnB Chenango	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
CnC Chenango	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
CoB Collamer	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Good.
CoC Collamer	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: slope, wetness.	Fair: slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CoD---------- Collamer	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope.	Poor: slope.
Du*. Dumps					
ErA---------- Erie	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Severe: wetness.	Fair: small stones.
ErB---------- Erie	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: small stones.
ESB*---------- Erie	Severe: large stones, wetness, percs slowly.	Moderate: slope.	Severe: large stones, wetness.	Severe: wetness.	Poor: large stones.
FAC---------- Farmington	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
Fd---------- Fredon	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
Ha---------- Halsey	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
HH*. Histic Humaquepts					
HLC*---------- Hollis	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, area reclaim.
HLD*---------- Hollis	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
HoA, HoB---------- Hoosic	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
HoC---------- Hoosic	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
HoD---------- Hoosic	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope, small stones.
LdB---------- Lordstown	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Fair: small stones, thin layer.
LdC---------- Lordstown	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, small stones, thin layer.
Ma---------- Madalin	Severe: percs slowly, wetness.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MdB Mardin	Severe: percs slowly, wetness.	Moderate: slope, small stones.	Severe: wetness.	Moderate: wetness.	Fair: small stones.
MdC Mardin	Severe: percs slowly, wetness.	Severe: slope.	Severe: slope, wetness.	Moderate: slope, wetness.	Fair: small stones.
MdD, MNE* Mardin	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Poor: slope.
My Middlebury	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Good.
NaD Nassau	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
OkA, OkB Oakville	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
OtB Otisville	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: area reclaim.
OtC Otisville	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: area reclaim.
OtD Otisville	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope, area reclaim.
OVE*: Otisville	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, area reclaim.
Hoosic	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, small stones.
Pa, Pb Palms	Severe: wetness, floods, subsides.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness, hard to pack.
Pg*. Pits					
PtB Pittsfield	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
PtC Pittsfield	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, small stones.
PtD Pittsfield	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
Qu* Quarries					

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ra Raynham	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
RbA Rhinebeck	Severe: percs slowly, wetness.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
RbB Rhinebeck	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
RhA, RhB Riverhead	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer, area reclaim.
RhC Riverhead	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, thin layer, area reclaim.
RhD Riverhead	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
RKC*: Rock outcrop.					
Arnot	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: small stones, thin layer.
RKD*, RKF*: Rock outcrop.					
Arnot	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, small stones, thin layer.
RMC*: Rock outcrop.					
Farmington	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
RMD*: Rock outcrop.					
Farmington	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
ROC*: Rock outcrop.					
Hollis	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, area reclaim.
ROD*: Rock outcrop.					

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ROD*:					
Hollis	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
ROF*:					
Rock outcrop.					
Hollis	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
RSB*:					
Rock outcrop.					
Nassau	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, area reclaim.
RSD*:					
Rock outcrop.					
Nassau	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
RSF*:					
Rock outcrop.					
Nassau	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Sb	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Scarboro					
ScA, ScB	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage, wetness.	Good.
Scio					
Su	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: area reclaim.
Suncook					
SwB	Severe: percs slowly, wetness.	Moderate: slope, small stones.	Severe: wetness.	Moderate: wetness.	Fair: small stones.
Swartswood					
SwC	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: slope, wetness.	Fair: slope, small stones.
Swartswood					
SwD	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope.	Poor: slope.
Swartswood					
SXC*:					
Swartswood	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: slope, wetness.	Fair: slope, large stones.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SXC*: Mardin	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: slope, wetness.	Fair: slope, large stones.
SXD*, SXF*: Swartswood	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope.
Mardin	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope.
Tg Tioga	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
UF*: Udifluvents.					
Fluvaquents.					
UH*. Udorthents					
UnB Unadilla	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
UnC Unadilla	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope.
Ur*. Urban land					
Wa Wallkill	Severe: floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness.
Wd Wayland	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
WuB Wurtsboro	Severe: percs slowly, wetness.	Moderate: slope, small stones.	Severe: wetness.	Severe: wetness.	Fair: small stones, thin layer.
WuC Wurtsboro	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ab Alden	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
AC* Alden	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, large stones.
AdA, AdB Allard	Poor: frost action.	Good	Good	Good.
ANC*: Arnot	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: small stones, area reclaim.
Lordstown	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, thin layer.
AND*: Arnot	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, small stones, area reclaim.
Lordstown	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones, thin layer.
ANF*: Arnot	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, small stones, area reclaim.
Lordstown	Poor: slope, thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones, thin layer.
Ba Barbour	Fair: frost action.	Fair: excess fines.	Fair: excess fines.	Fair: thin layer.
Be Basher	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
BnB*, BnC*: Bath	Fair: frost action.	Poor: excess fines, small stones.	Poor: excess fines.	Poor: small stones.
Nassau	Poor: thin layer, area reclaim.	Unsuited: thin layer, excess fines.	Unsuited: thin layer.	Poor: area reclaim, small stones.
Ca Canandaigua	Poor: wetness, frost action.	Fair: excess fines.	Poor: excess fines.	Poor: wetness.
Cd, Ce, Cf Carlisle	Poor: low strength, wetness.	Unsuited: excess humus.	Unsuited: excess humus.	Poor: wetness, excess humus.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CgA, CgB---------- Castile	Poor: frost action.	Fair: thin layer.	Good----------	Poor: small stones.
ChB---------- Charlton	Good----------	Unsuited: excess fines.	Poor: excess fines.	Fair: small stones.
ChC---------- Charlton	Good----------	Unsuited: excess fines.	Poor: excess fines.	Fair: small stones, slope.
CLC*:				
Charlton----------	Fair: large stones.	Unsuited: excess fines.	Poor: excess fines.	Poor: large stones.
Paxton----------	Fair: frost action, large stones.	Unsuited: excess fines.	Poor: excess fines.	Poor: large stones.
CLD*:				
Charlton----------	Fair: slope, large stones.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, large stones.
Paxton----------	Fair: slope, large stones.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, large stones.
CnA, CnB, CnC--------- Chenango	Fair: frost action.	Fair: thin layer.	Good----------	Poor: small stones.
CoB---------- Collamer	Poor: frost action.	Poor: excess fines.	Unsuited: excess fines.	Good.
CoC---------- Collamer	Poor: frost action.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope.
CoD---------- Collamer	Poor: frost action.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
Du* Dumps				
ErA, ErB---------- Erie	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
ESB*---------- Erie	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
FAC---------- Farmington	Poor: thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: thin layer, excess fines.	Poor: area reclaim.
Fd---------- Fredon	Poor: wetness, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: wetness, small stones, thin layer.
Ha---------- Halsey	Poor: wetness, frost action.	Fair: excess fines.	Fair: excess fines.	Poor: wetness.
HH*. Histic Humaquepts				
HLC*---------- Hollis	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: thin layer, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HLD* Hollis	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, thin layer, area reclaim.
HoA, HoB, HoC Hoosic	Good	Fair: excess fines.	Good	Poor: small stones.
HoD Hoosic	Fair: slope.	Fair: excess fines.	Good	Poor: slope, small stones.
LdB, LdC Lordstown	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, thin layer.
Ma Madalin	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, too clayey.
MdB, MdC Mardin	Fair: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
MdD Mardin	Fair: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
MNE* Mardin	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
My Middlebury	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
NaD Nassau	Poor: thin layer, area reclaim.	Unsuited: thin layer, excess fines.	Unsuited: thin layer.	Poor: slope, area reclaim, small stones.
OkA, OkB Oakville	Good	Good	Unsuited: excess fines.	Poor: too sandy.
OtB, OtC Otisville	Good	Good	Good	Poor: small stones.
OtD Otisville	Fair: slope.	Good	Good	Poor: slope, thin layer.
OVE*: Otisville	Poor: slope.	Good	Good	Poor: slope, thin layer.
Hoosic	Poor: slope.	Fair: excess fines.	Good	Poor: slope, small stones.
Pa, Pb Palms	Poor: wetness, low strength.	Unsuited: excess humus, excess fines.	Unsuited: excess humus, excess fines.	Poor: wetness, excess humus.
Pg*. Pits				
PtB, PtC Pittsfield	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PtD---------- Pittsfield	Fair: slope, frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Qu*. Quarries				
Ra---------- Raynham	Poor: frost action, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
RbA, RbB---------- Rhinebeck	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
RhA, RhB---------- Riverhead	Fair: frost action.	Fair: excess fines.	Poor: excess fines.	Good.
RhC---------- Riverhead	Fair: frost action.	Fair: excess fines.	Poor: excess fines.	Fair: slope.
RhD---------- Riverhead	Fair: slope, frost action.	Fair: excess fines.	Poor: excess fines.	Poor: slope.
RKC*: Rock outcrop.				
Arnot----------	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: small stones, area reclaim.
RKD*: Rock outcrop.				
Arnot----------	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, small stones, area reclaim.
RKF*: Rock outcrop.				
Arnot----------	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, small stones, area reclaim.
RMC*: Rock outcrop.				
Farmington----------	Poor: thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: thin layer, excess fines.	Poor: area reclaim.
RMD*: Rock outcrop.				
Farmington----------	Poor: thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: thin layer, excess fines.	Poor: slope, area reclaim.
ROC*: Rock outcrop.				
Hollis----------	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: thin layer, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ROD*:				
Rock outcrop.				
Hollis	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, thin layer, area reclaim.
ROF*:				
Rock outcrop.				
Hollis	Poor: slope, thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, thin layer, area reclaim.
RSB*:				
Rock outcrop.				
Nassau	Poor: thin layer, area reclaim.	Unsuited: thin layer, excess fines.	Unsuited: thin layer.	Poor: area reclaim, small stones.
RSD*:				
Rock outcrop.				
Nassau	Poor: thin layer, area reclaim.	Unsuited: thin layer, excess fines.	Unsuited: thin layer.	Poor: slope, area reclaim, small stones.
RSF*:				
Rock outcrop.				
Nassau	Poor: slope, thin layer, area reclaim.	Unsuited: thin layer, excess fines.	Unsuited: thin layer.	Poor: slope, area reclaim, small stones.
Sb Scarboro	Poor: wetness.	Good	Poor: excess fines.	Poor: wetness, too sandy.
ScA, ScB Scio	Poor: frost action.	Poor: excess fines.	Poor: excess fines.	Good.
Su Suncook	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
SwB, SwC Swartswood	Fair: frost action.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
SwD Swartswood	Fair: slope, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.
SXC*:				
Swartswood	Fair: frost action.	Poor: excess fines.	Poor: excess fines.	Poor: large stones.
Mardin	Fair: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
SXD*, SXF*:				
Swartswood	Poor: slope.	Poor: excess fines.	Poor: excess fines.	Poor: slope, large stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SXD*, SXF*: Mardin	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
Tg Tioga	Fair: frost action.	Unsuited: excess fines.	Poor: excess fines.	Good.
UF*: Udifluvents.				
Fluvaquents.				
UH*. Udorthents				
UnB Unadilla	Poor: frost action.	Fair: excess fines.	Fair: excess fines.	Good.
UnC Unadilla	Poor: frost action.	Fair: excess fines.	Fair: excess fines.	Fair: slope.
Ur*. Urban land				
Wa Wallkill	Poor: low strength, frost action, excess humus.	Unsuited: excess fines, excess humus.	Unsuited: excess fines, excess humus.	Poor: wetness.
Wd Wayland	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
WuB Wurtsboro	Fair: frost action, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
WuC Wurtsboro	Fair: frost action, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Slope, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Ab Alden	Favorable	Wetness	Favorable	Wetness, percs slowly, poor outlets.	Not needed	Wetness, erodes easily.
AC* Alden	Favorable	Large stones, wetness.	Large stones	Large stones, percs slowly, poor outlets.	Not needed	Wetness, large stones, erodes easily.
AdA Allard	Seepage	Seepage, piping, erodes easily.	No water	Not needed	Not needed	Erodes easily.
AdB Allard	Seepage	Seepage, piping, erodes easily.	No water	Not needed	Piping, erodes easily.	Erodes easily.
ANC*: Arnot	Slope, depth to rock, seepage.	Thin layer, depth to rock.	Depth to rock, no water.	Not needed	Depth to rock, droughty.	Slope, rooting depth, droughty.
Lordstown	Slope, depth to rock, seepage.	Depth to rock, thin layer.	No water	Not needed	Depth to rock, rooting depth.	Slope, rooting depth.
AND*, ANF*: Arnot	Slope, depth to rock, seepage.	Thin layer, depth to rock.	Depth to rock, no water.	Not needed	Slope, depth to rock, droughty.	Slope, rooting depth, droughty.
Lordstown	Slope, depth to rock, seepage.	Depth to rock, thin layer.	No water	Not needed	Slope, depth to rock, rooting depth.	Slope, rooting depth.
Ba Barbour	Seepage	Piping, seepage.	Deep to water	Not needed	Not needed	Erodes easily.
Be Basher	Seepage	Piping, seepage.	Favorable	Floods, poor outlets.	Not needed	Erodes easily.
BnB*: Bath	Depth to rock	Depth to rock	No water	Not needed	Rooting depth, percs slowly.	Rooting depth.
Nassau	Depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed	Depth to rock, droughty.	Rooting depth, droughty.
BnC*: Bath	Slope, depth to rock.	Depth to rock	No water	Not needed	Rooting depth, percs slowly.	Slope, rooting depth.
Nassau	Slope, depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed	Depth to rock, droughty.	Slope, rooting depth, droughty.
Ca Canandaigua	Seepage	Piping, low strength.	Favorable	Cutbanks cave, poor outlets, wetness.	Not needed	Erodes easily, wetness.
Cd, Ce, Cf Carlisle	Seepage	Excess humus, wetness.	Slow refill	Excess humus, floods, frost action.	Not needed	Wetness.
CgA Castile	Seepage	Seepage, thin layer, piping.	Deep to water	Cutbanks cave	Not needed	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
CgB---------- Castile	Seepage---------	Seepage, thin layer, piping.	Deep to water	Cutbanks cave	Piping, wetness.	Wetness.
ChB, ChC---------- Charlton	Seepage, slope.	Seepage---------	No water--------	Not needed-----	Slope, erodes easily.	Slope, erodes easily.
CLC*, CLD*: Charlton---------	Seepage, slope.	Seepage, large stones.	No water--------	Not needed-----	Large stones, slope, erodes easily.	Large stones, slope, erodes easily.
Paxton----------	Slope----------	Large stones, piping, erodes easily.	No water--------	Not needed-----	Large stones, percs slowly, erodes easily.	Large stones, percs slowly, erodes easily.
CnA---------- Chenango	Seepage---------	Seepage, piping.	No water--------	Not needed-----	Not needed-----	Droughty.
CnB---------- Chenango	Seepage---------	Seepage, piping.	No water--------	Not needed-----	Piping, small stones.	Droughty.
CnC---------- Chenango	Slope, seepage.	Seepage, piping.	No water--------	Not needed-----	Piping, small stones.	Slope, droughty.
CoB---------- Collamer	Favorable------	Low strength, piping.	Slow refill, cutbanks cave.	Cutbanks cave	Erodes easily, piping.	Erodes easily, piping.
CoC---------- Collamer	Slope----------	Low strength, piping.	Slow refill, cutbanks cave.	Slope, cutbanks cave.	Erodes easily, piping.	Slope, erodes easily, piping.
CoD---------- Collamer	Slope----------	Low strength, piping.	Slow refill, cutbanks cave.	Slope, cutbanks cave.	Slope, erodes easily, piping.	Slope, erodes easily, piping.
Du*. Dumps						
ErA---------- Erie	Favorable------	Favorable------	Favorable------	Percs slowly---	Not needed-----	Wetness, rooting depth, percs slowly.
ErB---------- Erie	Favorable------	Favorable------	Favorable------	Percs slowly---	Wetness, percs slowly, rooting depth.	Wetness, rooting depth, percs slowly.
ESB*---------- Erie	Favorable------	Large stones---	Large stones---	Percs slowly, large stones.	Large stones, wetness, percs slowly.	Large stones, wetness, rooting depth.
FAC---------- Farmington	Slope, depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed-----	Depth to rock	Slope, rooting depth.
Fd---------- Fredon	Seepage---------	Seepage---------	Favorable------	Poor outlets---	Wetness--------	Wetness.
Ha---------- Halsey	Seepage---------	Seepage---------	Favorable------	Wetness, poor outlets.	Not needed-----	Wetness.
HH*. Histic Humaquepts						
HLC*, HLD*-------- Hollis	Slope, depth to rock, seepage.	Thin layer, piping, seepage.	No water, depth to rock.	Not needed-----	Slope, depth to rock, rooting depth.	Slope, droughty, rooting depth.
HoA---------- Hoosic	Seepage---------	Seepage, piping.	No water--------	Not needed-----	Not needed-----	Droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
HoB---------- Hoosic	Seepage--------	Seepage, piping.	No water-------	Not needed-----	Piping, too sandy.	Droughty.
HoC---------- Hoosic	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Piping, too sandy.	Slope, droughty.
HoD---------- Hoosic	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Slope, piping, too sandy.	Slope, droughty.
LdB---------- Lordstown	Depth to rock, seepage.	Depth to rock, thin layer.	No water-------	Not needed-----	Depth to rock, rooting depth.	Rooting depth.
LdC---------- Lordstown	Slope, depth to rock, seepage.	Depth to rock, thin layer.	No water-------	Not needed-----	Depth to rock, rooting depth.	Slope, rooting depth.
Ma---------- Madalin	Favorable------	Low strength---	Slow refill----	Wetness, percs slowly, poor outlets.	Not needed-----	Wetness, percs slowly.
MdB---------- Mardin	Favorable------	Favorable------	Deep to water	Percs slowly---	Percs slowly, rooting depth.	Percs slowly, rooting depth.
MdC---------- Mardin	Slope----------	Favorable------	Deep to water	Slope, percs slowly.	Percs slowly, rooting depth.	Slope, percs slowly, rooting depth.
MdD, MNE*--------- Mardin	Slope----------	Favorable------	Deep to water	Slope, percs slowly.	Slope, percs slowly, rooting depth.	Slope, percs slowly, rooting depth.
My---------- Middlebury	Favorable------	Piping, low strength.	Deep to water, cutbanks cave.	Floods, poor outlets.	Not needed-----	Erodes easily, piping.
NaD---------- Nassau	Slope, depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed-----	Slope, depth to rock, droughty.	Slope, rooting depth, droughty.
OkA---------- Oakville	Seepage--------	Piping, seepage.	No water-------	Not needed-----	Not needed-----	Droughty.
OkB---------- Oakville	Seepage--------	Piping, seepage.	No water-------	Not needed-----	Too sandy, soil blowing.	Droughty.
OtB---------- Otisville	Seepage--------	Seepage, piping.	No water-------	Not needed-----	Too sandy------	Droughty.
OtC---------- Otisville	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Too sandy------	Slope, droughty.
OtD---------- Otisville	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Slope, too sandy.	Slope, droughty.
OVE*: Otisville--------	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Slope, too sandy.	Slope, droughty.
Hoosic----------	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Slope, piping, too sandy.	Slope, droughty.
Pa, Pb---------- Palms	Seepage--------	Excess humus, wetness.	Slow refill----	Floods, frost action, excess humus.	Not needed-----	Wetness.
Pg*. Pits						

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
PtB, PtC, PtD----- Pittsfield	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Slope----------	Slope.
Qu*. Quarries						
Ra---------- Raynham	Favorable------	Piping, low strength, erodes easily.	Favorable------	Wetness, percs slowly.	Wetness, percs slowly, erodes easily.	Wetness, percs slowly, erodes easily.
RbA---------- Rhinebeck	Favorable------	Low strength, erodes easily.	Slow refill----	Percs slowly---	Not needed-----	Wetness, percs slowly, erodes easily.
RbB---------- Rhinebeck	Favorable------	Low strength, erodes easily.	Slow refill----	Percs slowly---	Wetness, erodes easily, percs slowly.	Wetness, percs slowly, erodes easily.
RhA---------- Riverhead	Seepage--------	Seepage, piping.	No water-------	Not needed-----	Not needed-----	Droughty.
RhB---------- Riverhead	Seepage--------	Seepage, piping.	No water-------	Not needed-----	Piping---------	Droughty.
RhC---------- Riverhead	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Piping---------	Slope, droughty.
RhD---------- Riverhead	Slope, seepage.	Seepage, piping.	No water-------	Not needed-----	Slope, piping.	Slope, droughty.
RKC*: Rock outcrop.						
Arnot----------	Slope, depth to rock, seepage.	Thin layer, depth to rock.	Depth to rock, no water.	Not needed-----	Depth to rock, droughty.	Slope, rooting depth, droughty.
RKD*, RKF*: Rock outcrop.						
Arnot----------	Slope, depth to rock, seepage.	Thin layer, depth to rock.	Depth to rock, no water.	Not needed-----	Slope, depth to rock, droughty.	Slope, rooting depth, droughty.
RMC*: Rock outcrop.						
Farmington-------	Slope, depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed-----	Depth to rock	Slope, rooting depth.
RMD*: Rock outcrop.						
Farmington-------	Slope, depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed-----	Slope, depth to rock.	Slope, rooting depth.
ROC*, ROD*, ROF*: Rock outcrop.						
Hollis----------	Slope, depth to rock, seepage.	Thin layer, piping, seepage.	No water, depth to rock.	Not needed-----	Slope, depth to rock, rooting depth.	Slope, droughty, rooting depth.
RSB*: Rock outcrop.						
Nassau----------	Depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed-----	Depth to rock, droughty.	Rooting depth, droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
RSD*, RSF*: Rock outcrop.						
Nassau	Slope, depth to rock, seepage.	Depth to rock	Depth to rock, no water.	Not needed	Slope, depth to rock, droughty.	Slope, rooting depth, droughty.
Sb Scarboro	Seepage	Hard to pack, seepage.	Favorable	Cutbanks cave, wetness.	Wetness	Wetness.
ScA Scio	Seepage	Erodes easily, piping, seepage.	Cutbanks cave, deep to water.	Cutbanks cave	Not needed	Erodes easily.
ScB Scio	Seepage	Erodes easily, piping, seepage.	Cutbanks cave, deep to water.	Cutbanks cave	Erodes easily, wetness.	Erodes easily.
Su Suncook	Seepage, floods.	Seepage, erodes easily.	Deep to water	Not needed	Not needed	Not needed.
SwB, SwC, SwD Swartswood	Slope	Favorable	No water	Not needed	Percs slowly, erodes easily.	Percs slowly, erodes easily.
SXC*: Swartswood	Slope	Large stones	No water	Not needed	Large stones, percs slowly.	Large stones, percs slowly.
Mardin	Slope	Large stones	Deep to water, large stones.	Slope, percs slowly, large stones.	Large stones, rooting depth.	Slope, large stones, rooting depth.
SXD*, SXF*: Swartswood	Slope	Large stones	No water	Not needed	Large stones, percs slowly.	Large stones, percs slowly.
Mardin	Slope	Large stones	Deep to water, large stones.	Slope, percs slowly, large stones.	Slope, large stones, rooting depth.	Slope, large stones, rooting depth.
Tg Tioga	Seepage	Piping, seepage.	Deep to water	Not needed	Not needed	Erodes easily.
UF*: Udifluvents.						
Fluvaquents.						
UH*. Udorthents						
UnB Unadilla	Seepage	Low strength, piping, seepage.	Deep to water	Not needed	Erodes easily, piping.	Erodes easily.
UnC Unadilla	Seepage, slope.	Low strength, piping, seepage.	Deep to water	Not needed	Erodes easily, piping.	Slope, erodes easily.
Ur*. Urban land						
Wa Wallkill	Seepage	Low strength, piping, excess humus.	Favorable	Floods, poor outlets, frost action.	Not needed	Wetness.
Wd Wayland	Favorable	Piping	Favorable	Wetness, floods, poor outlets.	Not needed	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
WuB, WuC---------- Wurtsboro	Slope----------	Favorable------	Deep to water	Percs slowly, slope.	Percs slowly, slope, rooting depth.	Percs slowly, slope, rooting depth.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.-- ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ab---------- Alden	0-9	Silt loam-------	ML, OL	A-7, A-5	0	80-100	75-100	65-95	55-85	40-50	5-15
	9-36	Silt loam, silty clay loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-95	55-85	20-35	5-15
	36-60	Gravelly loam, fine sandy loam, silty clay loam.	CL, GC, SC, CL-ML	A-2, A-4, A-6	0-5	60-95	50-90	45-90	30-85	20-35	5-15
AC*---------- Alden	0-9	Extremely stony silt loam.	ML, OL	A-7, A-5	5-15	80-100	75-100	65-95	55-85	40-50	5-15
	9-36	Silt loam, silty clay loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-95	55-85	20-35	5-15
	36-60	Gravelly loam, fine sandy loam, silty clay loam.	CL, GC, SC, CL-ML	A-2, A-4, A-6	0-5	60-95	50-90	45-90	30-85	20-35	5-15
AdA, AdB---------- Allard	0-9	Silt loam-------	ML, CL-ML, SM, SM-SC	A-4	0	100	95-100	65-100	35-90	<35	NP-6
	9-35	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	100	95-100	90-100	60-90	<35	NP-6
	35-60	Stratified sand to very gravelly loamy sand.	GM, GW, SW, SM	A-1, A-2, A-3	0	25-100	20-100	10-75	0-30	---	NP
ANC*, AND*, ANF*: Arnot----------	0-4	Channery silt loam.	ML, GM, SM	A-2, A-4	5-10	60-85	55-80	45-80	30-70	<30	NP-5
	4-15	Very channery silt loam, very channery loam.	GM, GM-GC	A-2, A-4, A-1	10-25	30-60	25-55	20-55	15-50	<30	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lordstown---------	0-6	Channery silt loam.	ML, GM, SM	A-4	5-20	65-85	50-75	50-75	40-65	<30	NP-4
	6-37	Channery silt loam, channery loam.	ML, GM, SM	A-4	5-10	65-85	50-75	50-75	40-65	<30	NP-4
Ba---------- Barbour	0-11	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4, A-2	0	80-100	75-100	50-95	30-90	15-25	2-7
	11-28	Silt loam, sandy loam, gravelly loam.	ML, SM, CL-ML, SM-SC	A-4, A-2, A-1	0	60-100	55-95	30-95	15-85	15-25	2-7
	28-60	Loamy sand, very gravelly sand, gravelly loamy fine sand.	SM, SP, GM, GP	A-1, A-2, A-3, A-4	0-5	35-95	30-95	20-80	2-40	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Be---------- Basher	0-13	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4, A-2	0-5	80-100	75-100	45-100	20-90	15-25	2-7
	13-30	Silt loam, loam, gravelly fine sandy loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0-5	75-100	70-100	40-100	20-90	15-25	2-7
	30-60	Silt loam, gravelly loam, fine sandy loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0-5	75-100	70-100	40-100	20-90	15-25	2-7
BnB*:											
Bath---------- Nassau----------	0-9	Shaly silt loam	ML, GM, SM, OL	A-2, A-4	5-15	55-80	50-75	40-75	30-70	30-40	5-10
	9-29	Channery loam, shaly silt loam, silt loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	5-10	55-95	50-90	40-85	20-80	20-35	NP-7
	29-53	Channery loam, very shaly silt loam, shaly sandy loam.	GM, SM, GM-GC, ML	A-1, A-2, A-4	10-15	30-80	25-75	15-75	10-70	<25	NP-6
	53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
	0-10	Shaly silt loam	ML, GM, SM, CL-ML	A-2, A-4	5-20	50-85	45-80	40-75	25-70	10-20	1-6
	10-18	Very shaly silt loam, very shaly loam.	GM, GM-GC	A-2, A-4, A-1	10-25	45-70	25-55	20-55	15-50	10-20	1-6
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BnC*:											
Bath---------- Nassau----------	0-9	Shaly silt loam	ML, GM, SM, OL	A-2, A-4	5-15	55-80	50-75	40-75	30-70	30-40	5-10
	9-29	Channery loam, shaly silt loam, silt loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	5-10	55-95	50-90	40-85	20-80	20-35	NP-7
	29-53	Channery loam, very shaly silt loam, shaly sandy loam.	GM, SM, GM-GC, ML	A-1, A-2, A-4	10-15	30-80	25-75	15-75	10-70	<25	NP-6
	53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
	0-10	Shaly silt loam	ML, GM, SM, CL-ML	A-2, A-4	5-20	50-85	45-80	40-75	25-70	10-20	1-6
	10-18	Very shaly silt loam, very shaly loam.	GM, GM-GC	A-2, A-4, A-1	10-25	45-70	25-55	20-55	15-50	10-20	1-6
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ca---------- Canandaigua	0-8	Silt loam-------	ML, CL, OL	A-4, A-5, A-7	0	95-100	90-100	80-100	65-95	35-45	10-20
	8-35	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	65-95	20-40	5-20
	35-60	Stratified sand to loamy fine sand.	SW, SP, SM, SW-SM	A-1, A-2, A-3	0-5	55-100	50-100	25-80	2-35	---	NP
Cd, Ce, Cf--------- Carlisle	0-94	Sapric material	Pt	---	---	---	---	---	---	---	---
CgA, CgB---------- Castile	0-9	Gravelly silt loam.	ML, GM, SM, CL-ML	A-2, A-4	0-5	55-80	50-75	40-75	30-65	<30	NP-10
	9-50	Very gravelly loam, very gravelly sandy loam, gravelly silt loam.	GM, SM, ML, GM-GC	A-1, A-2, A-4	5-10	40-75	35-70	20-65	10-60	<30	NP-10
	50-60	Very gravelly sand, very gravelly loam, very gravelly loamy sand.	GW, GP, GW-GM, GM	A-1, A-2	5-10	30-55	25-50	10-45	0-40	---	NP
ChB, ChC---------- Charlton	0-9	Fine sandy loam	SM, ML	A-2, A-4	5-10	75-95	70-90	60-85	30-70	---	NP-5
	9-25	Fine sandy loam, gravelly sandy loam, gravelly loam.	SM, ML	A-2, A-4	5-15	65-90	60-90	50-80	20-65	---	NP-3
	25-60	Very gravelly sandy loam, gravelly fine sandy loam, gravelly loam.	SM, GM	A-2, A-4 A-1	5-15	40-90	35-85	25-70	10-45	---	NP
CLC*, CLD*: Charlton----------	0-9	Extremely stony fine sandy loam.	SM, ML	A-2, A-4	15-35	75-95	70-90	60-85	30-70	---	NP-5
	9-25	Fine sandy loam, gravelly sandy loam, gravelly loam.	SM, ML	A-2, A-4	5-15	65-90	60-90	50-80	20-65	---	NP-3
	25-60	Gravelly loam, gravelly fine sandy loam, gravelly sandy loam.	SM, GM	A-2, A-4 A-1	5-15	40-90	35-85	25-70	10-45	---	NP
Paxton----------	0-2	Extremely stony loam.	SM, ML, SM-SC	A-2, A-4	10-25	80-90	70-85	60-80	30-65	<30	<10
	2-21	Fine sandy loam, loam, gravelly sandy loam.	SM, ML, SM-SC	A-2, A-4	5-20	70-90	65-90	50-85	25-65	<30	<10
	21-60	Fine sandy loam, loam, gravelly sandy loam.	SM, ML, SM-SC	A-2, A-4	5-15	70-90	60-85	50-75	20-60	<30	<10

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CnA, CnB, CnC------ Chenango	0-6	Gravelly silt loam.	ML, SM, GM	A-2, A-4, A-1	5-15	55-85	55-80	35-80	15-70	<35	NP-10
	6-28	Gravelly silt loam, gravelly fine sandy loam, very gravelly silt loam.	ML, GM, SM	A-2, A-4, A-1	5-10	35-80	30-75	25-75	15-65	<40	NP-10
	28-60	Very gravelly loamy coarse sand, very gravelly sand, gravelly loamy fine sand.	GW, GM, SM, SP	A-1	5-10	25-65	20-60	10-50	1-20	---	NP
CoB, CoC, CoD------ Collamer	0-6	Silt loam-------	SC, CL, CL-ML, SM-SC	A-4	0	95-100	90-100	65-95	40-85	20-30	5-10
	6-12	Silt loam, very fine sandy loam, fine sandy loam.	SC, CL, CL-ML, SM-SC	A-4	0	95-100	95-100	65-95	40-85	20-30	5-10
	12-35	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	75-95	20-30	5-15
	35-60	Stratified silt to very fine sand.	ML, SM	A-4	0	95-100	95-100	70-100	40-90	<15	NP-4
Du*. Dumps											
ErA, ErB---------- Erie	0-9	Gravelly silt loam.	GM, ML, SM	A-2, A-4	0-5	60-80	60-75	40-70	25-60	30-40	5-10
	9-18	Channery fine sandy loam, channery silt loam, channery loam.	GC, SC, CL, CL-ML	A-2, A-4, A-1	5-10	60-80	55-75	40-70	20-65	15-25	5-10
	18-54	Channery silt loam, channery silty clay loam, very channery loam.	CL, GC, SC	A-2, A-6	10-25	55-80	50-70	40-65	30-65	25-35	10-15
	54-70	Channery silt loam, channery silty clay loam, very channery loam.	CL, GC, SC	A-2, A-6	10-25	55-80	50-70	40-65	30-65	25-35	10-15
ESB*--------------- Erie	0-9	Extremely stony silt loam.	GM, ML, SM	A-2, A-4	10-25	55-80	50-70	40-65	25-65	30-40	5-10
	9-18	Channery fine sandy loam, channery silt loam, channery loam.	GC, SC, CL, CL-ML	A-2, A-4, A-1	5-10	60-80	55-75	40-70	20-55	15-25	5-10
	18-54	Channery silt loam, channery silty clay loam, very channery loam.	CL, GC, SC	A-2, A-6	10-25	55-80	50-70	40-65	30-65	25-35	10-15
	54-70	Channery silt loam, channery silty clay loam, very channery loam.	CL, GC, SC	A-2, A-6	10-25	55-80	50-70	40-65	30-65	25-35	10-15

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FAC---------- Farmington	0-8	Silt loam-------	ML, CL, SM, SC	A-2, A-4, A-6	0-5	80-95	75-90	50-85	30-80	20-35	3-15
	8-19	Silt loam, loam, gravelly fine sandy loam.	ML, CL, GM, GC	A-2, A-4, A-6, A-1	0-5	60-95	55-90	35-85	20-80	20-35	3-15
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Fd---------- Fredon	0-6	Loam----------	ML, CL, SC, SM	A-2, A-4, A-1	0-2	60-100	30-95	30-90	15-70	20-30	NP-10
	6-24	Loam, silt loam, gravelly sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0-2	60-100	50-95	30-85	15-70	20-30	NP-10
	24-60	Stratified very gravelly sand to loamy fine sand.	GP, GM, GW, GW-GM	A-1, A-2	0-5	30-90	25-85	10-60	0-35	---	NP
Ha---------- Halsey	0-6	Silt loam-------	ML, CL, SM, SC	A-2, A-4	0-2	65-100	55-100	35-90	25-90	20-30	3-10
	6-22	Gravelly loam, silt loam.	SM, SC, ML, CL	A-2, A-4	0-2	65-100	50-100	35-90	30-85	20-30	3-10
	22-60	Stratified sandy loam to very gravelly sand.	SP, GP, GM, SM	A-1, A-2, A-3	5-10	30-90	25-85	20-70	0-35	---	NP
HH*. Histic Humaquepts											
HLC*, HLD*--------- Hollis	0-4	Gravelly loam---	SM, ML	A-2, A-4	0-15	75-100	65-95	40-85	25-70	<20	NP-3
	4-14	Fine sandy loam, sandy loam, gravelly loam.	SM, ML	A-2, A-4	0-15	75-95	65-95	40-80	20-65	---	NP
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HoA, HoB, HoC, HoD- Hoosic	0-6	Gravelly sandy loam.	GM, SM, GP-GM, SP-SM	A-1, A-2, A-4	5-10	40-80	35-70	20-65	10-50	30-45	2-10
	6-22	Gravelly sandy loam, very gravelly sandy loam, gravelly loam.	GM, SM, GP-GM, SP-SM	A-1, A-2, A-4	5-10	40-75	35-65	20-60	10-45	20-30	2-8
	22-60	Very gravelly sand, very gravelly loamy sand.	GM, GP, SP, SM	A-1	10-15	35-65	30-50	15-40	2-20	---	NP
LdB, LdC---------- Lordstown	0-6	Channery silt loam.	ML, GM, SM	A-4	5-20	65-85	50-75	50-75	40-65	<30	NP-4
	6-37	Channery silt loam, channery loam.	ML, GM, SM	A-4	5-10	65-85	50-75	50-75	40-65	<30	NP-4
Ma---------- Madalin	0-10	Silt loam-------	ML, MH, OL, OH	A-6, A-7	0	95-100	95-100	85-100	65-95	45-65	10-25
	10-38	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	95-100	95-100	85-100	70-95	45-65	25-35
	38-60	Silty clay, clay	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	70-95	25-35	5-15

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MdB, MdC, MdD, MNE*---------- Mardin	0-8	Gravelly silt loam.	GM, ML, CL, GC	A-4	0-5	60-80	55-75	45-75	35-70	25-35	5-10
	8-20	Channery silt loam, loam, gravelly loam.	CL, GC, CL-ML, SM-SC	A-4	5-10	60-90	55-90	45-90	35-80	15-25	5-10
	20-60	Channery loam, channery silt loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4, A-1	10-25	40-80	35-75	20-70	20-65	20-30	5-10
My---------- Middlebury	0-11	Silt loam-------	ML, SM	A-4	0	85-100	75-100	65-100	45-85	<20	NP-4
	11-42	Silt loam, loam, gravelly fine sandy loam.	ML, SM	A-4, A-2	0	75-100	70-100	50-100	30-85	<20	NP-4
	42-60	Stratified gravelly sandy loam to sand.	GW, GM, SW, SM	A-1, A-2	0-5	45-95	40-85	15-50	0-30	---	NP
NaD---------- Nassau	0-10	Shaly silt loam	ML, GM, SM, CL-ML	A-2, A-4	5-20	50-85	45-80	40-75	25-70	10-20	1-6
	10-18	Very shaly silt loam, very shaly loam.	GM, GM-GC	A-2, A-4, A-1	10-25	45-70	25-55	20-55	15-50	10-20	1-6
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
OkA, OkB---------- Oakville	0-8	Loamy fine sand	SM	A-2	0	100	100	55-75	15-25	---	NP
	8-60	Fine sand-------	SM, SP, SP-SM	A-2, A-3	0	100	95-100	65-95	0-25	---	NP
OtB, OtC, OtD------ Otisville	0-6	Gravelly sandy loam.	SM, GM, SW-SM, GW-GM	A-1, A-2	0-10	55-80	50-75	25-50	10-30	---	NP
	6-28	Gravelly loamy sand, gravelly loamy fine sand, very gravelly sand.	SM, SP, GP, GM	A-1	0-10	45-65	40-60	20-50	3-25	---	NP
	28-60	Very gravelly sand, very gravelly loamy sand.	GP, SP, GW-GM, SP-SM	A-1	0-10	35-60	30-55	15-40	0-10	---	NP
OVE*: Otisville---------	0-6	Gravelly sandy loam.	SM, GM, SW-SM, GW-GM	A-1, A-2	0-10	55-80	50-75	25-50	10-30	---	NP
	6-28	Gravelly loamy sand, gravelly loamy fine sand, very gravelly sand.	SM, SP, GP, GM	A-1	0-10	45-65	40-60	20-50	3-25	---	NP
	28-60	Very gravelly sand, very gravelly loamy sand.	GP, SP, GW-GM, SP-SM	A-1	0-10	35-60	30-55	15-40	0-10	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
OVE*:											
Hoosic	0-6	Gravelly sandy loam.	GM, SM, GP-GM, SP-SM	A-1, A-2, A-4	5-10	40-80	35-70	20-65	10-50	30-45	2-10
	6-22	Gravelly sandy loam, very gravelly sandy loam, gravelly loam.	GM, SM, GP-GM, SP-SM	A-1, A-2, A-4	5-10	40-75	35-65	20-60	10-45	20-30	2-8
	22-60	Very gravelly sand, very gravelly loamy sand.	GM, GP, SP, SM	A-1	10-15	35-65	30-50	15-40	2-20	---	NP
Pa, Pb	0-25	Sapric material	Pt	---	---	---	---	---	---	---	---
Palms	25-60	Clay loam, silty clay loam, fine sandy loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
Pg*. Pits											
PtB, PtC, PtD	0-10	Gravelly loam---	ML, SM	A-2, A-4	0-15	75-80	70-75	50-70	30-55	<40	NP-6
Pittsfield	10-34	Fine sandy loam, loam, gravelly sandy loam.	SM, ML	A-1, A-2, A-4	0-15	75-95	70-90	40-85	20-70	<20	NP-4
	34-60	Fine sandy loam, loam, gravelly sandy loam.	SM, ML	A-1, A-2, A-4	0-15	75-95	70-90	40-85	20-70	<20	NP-3
Qu*. Quarries											
Ra	0-8	Silt loam-------	ML	A-4	0	100	95-100	80-100	55-95	20-35	NP-10
Raynham	8-26	Silt loam, silt, very fine sandy loam.	ML	A-4	0	100	95-100	80-100	55-95	20-35	NP-10
	26-60	Silt loam, silt, very fine sandy loam.	ML	A-4	0	100	95-100	80-100	55-95	20-35	NP-10
RbA, RbB	0-11	Silt loam-------	ML, MH, CL, CH	A-6, A-7	0	80-100	75-100	70-100	60-90	30-55	10-25
Rhinebeck	11-45	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	90-100	85-100	80-100	70-95	30-55	15-30
	45-60	Silty clay loam, silty clay, clay.	CH, CL	A-7, A-6	0	90-100	85-100	80-100	70-95	30-55	15-30
RhA, RhB, RhC, RhD-	0-9	Sandy loam------	SM, ML	A-2, A-4	0-5	95-100	90-100	55-95	30-75	14-18	1-3
Riverhead	9-26	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, GM	A-2, A-4, A-1	0-5	65-100	60-95	40-80	20-45	14-18	1-3
	26-30	Loamy sand, gravelly loamy sand, fine sandy loam.	SM, SP-SM, GM, GP-GM	A-1, A-2, A-4	0-5	60-90	55-85	30-70	10-45	---	NP
	30-60	Stratified sand and gravel.	SP, SW, SP-SM	A-1	0-5	60-95	55-90	25-50	0-10	---	NP
RKC*, RKD*, RKF*: Rock outcrop.											

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RKC*, RKD*, RKF*:											
Arnot	0-4	Channery silt loam.	ML, GM, SM	A-2, A-4	5-10	60-85	55-80	45-80	30-70	<30	NP-5
	4-15	Very channery silt loam, very channery loam.	GM, GM-GC	A-2, A-4, A-1	10-25	30-60	25-55	20-55	15-50	<30	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RMC*, RMD*:											
Rock outcrop.											
Farmington	0-8	Silt loam	ML, CL, SM, SC	A-2, A-4, A-6	0-5	80-95	75-90	50-85	30-80	20-35	3-15
	8-19	Silt loam, loam, gravelly fine sandy loam.	ML, CL, GM, GC	A-2, A-4, A-6, A-1	0-5	60-95	55-90	35-85	20-80	20-35	3-15
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ROC*, ROD*:											
Rock outcrop.											
Hollis	0-4	Gravelly loam	SM, ML	A-2, A-4	0-15	75-100	65-95	40-85	25-70	<20	NP-3
	4-14	Fine sandy loam, sandy loam, gravelly loam.	SM, ML	A-2, A-4	0-15	75-95	65-95	40-80	20-65	---	NP
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ROF*:											
Rock outcrop.											
Hollis	0-2	Gravelly loam	SM, ML	A-2, A-4	0-15	75-100	65-95	40-85	25-70	<20	NP-3
	2-15	Fine sandy loam, sandy loam, gravelly loam.	SM, ML	A-2, A-4	0-15	75-95	65-95	40-80	20-65	---	NP
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RSB*, RSD*, RSF*:											
Rock outcrop.											
Nassau	0-10	Shaly silt loam	ML, GM, SM, CL-ML	A-2, A-4	5-20	50-85	45-80	40-75	25-70	10-20	1-6
	10-18	Very shaly silt loam, very shaly loam.	GM, GM-GC	A-2, A-4, A-1	10-25	45-70	25-55	20-55	15-50	10-20	1-6
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sb	0-11	Mucky sandy loam.	SM, SP-SM	A-1, A-2, A-3, A-4	0	95-100	85-100	40-100	5-50	---	NP
Scarboro	11-15	Loamy fine sand, fine sand, sand.	SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-100	5-35	---	NP
	15-60	Loamy sand, sand, fine sand.	SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-100	5-35	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ScA, ScB----------	0-8	Silt loam-------	ML	A-4	0	100	95-100	80-100	60-90	<20	NP-4
Scio	8-35	Silt loam, very fine sandy loam.	ML	A-4	0	100	95-100	80-100	60-90	<20	NP-4
	35-60	Stratified very gravelly sand to silt loam.	ML, SM, SP, GP-GM	A-4, A-2, A-1, A-3	0	35-95	30-90	15-85	2-80	<10	NP-4
Su----------	0-4	Sandy loam------	SM	A-2	0	95-100	85-100	65-70	15-35	---	NP
Suncook	4-60	Stratified loamy fine sand to coarse sand.	SP, SM	A-1, A-2, A-3	0	60-100	45-100	20-95	0-35	---	NP
SwB, SwC, SwD------	0-1	Gravelly loam---	SM, ML, GM	A-1, A-2, A-4	0-20	60-90	50-85	30-80	15-65	---	---
Swartswood	1-31	Gravelly fine sandy loam, flaggy sandy loam, channery loam.	SM, ML, GM	A-1, A-2, A-4	0-25	60-90	50-90	30-85	15-65	<25	NP-3
	31-70	Very gravelly fine sandy loam, flaggy sandy loam, channery loam.	GM, SM, ML, GW-GM	A-1, A-2, A-4	5-25	50-85	35-80	20-75	10-60	<20	NP-3
SXC*, SXD*, SXF*:											
Swartswood--------	0-1	Very stony loam	SM, ML	A-2, A-4, A-1	3-15	60-90	50-85	30-80	15-65	---	---
	1-31	Channery loam, flaggy sandy loam, gravelly fine sandy loam.	SM, ML, GM	A-2, A-4, A-1	0-25	60-90	50-90	30-85	15-65	<25	NP-3
	31-70	Very gravelly fine sandy loam flaggy sandy loam, channery loam.	GM, SM, ML, GW-GM	A-2, A-1, A-4	5-25	50-80	35-80	20-70	10-60	<20	NP-3
Mardin----------	0-8	Very stony silt loam.	GM, ML, CL, GC	A-4	5-10	65-75	60-70	50-70	35-60	25-35	5-10
	8-20	Channery silt loam, loam, gravelly loam.	CL, GC, SC, CL-ML	A-4	5-10	60-90	55-90	45-90	35-80	15-25	5-10
	20-60	Channery loam, channery silt loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4, A-1	10-25	40-80	35-75	30-70	20-65	20-30	5-10
Tg----------	0-3	Silt loam-------	ML, SM	A-4	0	100	95-100	65-95	40-85	<15	NP-4
Tioga	3-40	Silt loam, loam, gravelly fine sandy loam.	SM, GM, ML	A-1, A-2, A-4	0	55-100	50-100	35-100	20-90	<15	NP-2
	40-60	Silt loam, gravelly loam, very gravelly loamy sand.	GW-GM, GM, SM, ML	A-1, A-2, A-4, A-3	0-10	35-100	30-100	15-100	5-90	<15	NP-2
UF*:											
Udifluvents.											
Fluvaquents.											
UH*.											
Udorthents											

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
UnB, UnC---------- Unadilla	0-8	Silt loam-------	ML, CL-ML	A-4	0	100	95-100	90-100	60-90	<35	NP-6
	8-44	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	100	95-100	90-100	60-90	<25	NP-6
	44-60	Very gravelly sand, gravelly sand, loamy sand.	GM, GP, SM, SP	A-2, A-1	0-10	35-100	25-95	10-70	1-30	---	NP
Ur*. Urban land											
Wa---------- Wallkill	0-9	Silt loam-------	ML, SM, OL	A-5, A-7	0	95-100	90-100	70-100	40-90	40-50	5-15
	9-18	Silt loam, loam, gravelly silt loam.	CL, CL-ML, SM-SC, SC	A-4	0	75-100	70-100	60-100	40-90	15-25	5-10
	18-60	Sapric material, hemic material.	Pt	A-8	0	---	---	---	---	---	---
Wd---------- Wayland	0-9	Silt loam-------	ML, OL	A-7, A-5	0	100	95-100	90-100	70-95	40-50	5-15
	9-47	Silt loam, silty clay loam.	ML, CL-ML, CL	A-6, A-4	0	100	95-100	90-100	70-95	25-45	5-15
	47-60	Stratified silt loam to gravelly fine sandy loam.	CL, CL-ML, SC, GC	A-2, A-4	0	65-100	55-100	50-95	25-90	15-25	5-10
WuB, WuC---------- Wurtsboro	0-1	Gravelly loam---	SM, GM	A-2, A-4	0-10	70-95	65-90	55-85	30-50	---	---
	1-23	Fine sandy loam, gravelly sandy loam, channery loam.	SM, GM	A-2, A-4	0-15	70-95	55-90	45-85	30-50	<30	NP-4
	23-60	Fine sandy loam, gravelly sandy loam, channery loam.	SM, GM	A-2, A-4, A-1	0-20	60-95	50-90	30-80	20-50	<25	NP-4

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
Ab Alden	0-9 9-36 36-60	0.6-2.0 0.2-0.6 0.2-0.6	0.16-0.22 0.14-0.20 0.08-0.15	6.1-7.3 6.1-7.3 6.6-8.4	Low Low Low	0.43 0.43 0.37	3
AC* Alden	0-9 9-36 36-60	0.6-2.0 0.2-0.6 0.2-0.6	0.16-0.22 0.14-0.20 0.08-0.15	6.1-7.3 6.1-7.3 6.6-8.4	Low Low Low	0.37 0.43 0.37	3
AdA, AdB Allard	0-9 9-35 35-60	0.6-2.0 0.6-2.0 >6.0	0.16-0.21 0.15-0.20 0.01-0.03	4.5-6.0 4.5-6.0 5.1-7.3	Low Low Low	0.49 0.64 0.17	4-3
ANC*, AND*, ANF*: Arnot	0-4 4-15 15	0.6-2.0 0.6-2.0 ---	0.10-0.15 0.08-0.12 ---	3.6-6.0 3.6-6.0 ---	Low Low ---	0.24 0.17 ---	2-1
Lordstown	0-6 6-37	0.6-2.0 0.6-2.0	0.11-0.17 0.10-0.16	4.5-6.5 4.5-6.0	Low Low	0.24 0.28	3
Ba Barbour	0-11 11-28 28-60	0.6-2.0 2.0-6.0 6.0-20	0.16-0.21 0.10-0.19 0.02-0.07	4.5-6.0 4.5-6.0 4.5-6.5	Low Low Low	0.49 0.37 0.17	4
Be Basher	0-13 13-30 30-60	0.6-2.0 0.6-2.0 0.6-6.0	0.15-0.21 0.10-0.19 0.10-0.19	3.6-6.0 3.6-6.0 4.5-6.5	Low Low Low	0.49 0.64 0.37	4
BnB*: Bath	0-9 9-29 29-53 53	0.6-2.0 0.6-2.0 <0.2 ---	0.10-0.20 0.08-0.18 0.01-0.06 ---	4.5-6.0 4.5-6.0 4.5-6.5 ---	Low Low Low ---	0.24 0.28 0.28 ---	3
Nassau	0-10 10-18 18	0.6-2.0 0.6-2.0 ---	0.08-0.16 0.07-0.12 ---	4.5-5.5 4.5-5.5 ---	Low Low ---	0.20 0.20 ---	2
BnC*: Bath	0-9 9-29 29-53 53	0.6-2.0 0.6-2.0 <0.2 ---	0.10-0.20 0.08-0.18 0.01-0.06 ---	4.5-6.0 4.5-6.0 4.5-6.5 ---	Low Low Low ---	0.24 0.28 0.28 ---	3
Nassau	0-10 10-18 18	0.6-2.0 0.6-2.0 ---	0.08-0.16 0.07-0.12 ---	4.5-5.5 4.5-5.5 ---	Low Low ---	0.20 0.20 ---	2
Ca Canandaigua	0-8 8-35 35-60	0.2-2.0 0.2-2.0 2.0-6.0	0.15-0.22 0.15-0.20 0.02-0.08	5.1-7.3 5.6-7.3 6.6-8.4	Low Low Low	0.49 0.43 0.17	3
Cd, Ce, Cf Carlisle	0-94	0.2-6.0	0.35-0.45	5.6-7.3	---	---	---
CgA, CgB Castile	0-9 9-50 50-60	0.6-6.0 2.0-6.0 >6.0	0.09-0.16 0.05-0.13 0.01-0.02	4.5-6.0 4.5-6.5 5.1-7.3	Low Low Very low	0.24 0.20 0.17	3

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
ChB, ChC----------	0-9	0.6-6.0	0.08-0.23	4.5-6.0	Low----------	0.20	3
Charlton	9-25	0.6-6.0	0.05-0.20	4.5-6.0	Low----------	0.43	
	25-60	0.6-6.0	0.05-0.16	4.5-6.0	Low----------	0.43	
CLC*, CLD*:							
Charlton--------	0-9	0.6-6.0	0.05-0.15	4.5-6.0	Low----------	0.17	3
	9-25	0.6-6.0	0.05-0.20	4.5-6.0	Low----------	0.43	
	25-60	0.6-6.0	0.05-0.16	4.5-6.0	Low----------	0.43	
Paxton----------	0-2	0.6-6.0	0.05-0.15	4.5-6.0	Low----------	0.24	3
	2-21	0.6-6.0	0.06-0.20	4.5-6.5	Low----------	0.43	
	21-60	<0.2	0.05-0.12	4.5-6.5	Low----------	0.17	
CnA, CnB, CnC----	0-6	0.6-6.0	0.08-0.15	4.5-5.5	Low----------	0.24	3
Chenango	6-28	0.6-6.0	0.05-0.14	4.5-6.0	Low----------	0.20	
	28-60	6.0-20.0	0.01-0.03	5.1-7.8	Low----------	0.17	
CoB, CoC, CoD----	0-6	0.6-2.0	0.14-0.21	5.1-7.3	Low----------	0.49	3
Collamer	6-12	0.6-2.0	0.14-0.20	5.1-7.3	Low----------	0.43	
	12-35	0.2-0.6	0.16-0.20	5.6-7.8	Low----------	0.43	
	35-60	0.2-0.6	0.12-0.20	6.1-8.4	Low----------	0.64	
Du*.							
Dumps							
ErA, ErB----------	0-9	0.6-2.0	0.10-0.17	4.5-6.0	Low----------	0.24	3
Erie	9-18	0.6-2.0	0.09-0.16	5.1-6.5	Low----------	0.28	
	18-54	<0.2	0.01-0.03	5.1-7.8	Low----------	0.28	
	54-70	<0.2	0.01-0.03	5.6-8.4	Low----------	0.28	
ESB*----------	0-9	0.6-2.0	0.10-0.17	4.5-6.0	Low----------	0.24	3
Erie	9-18	0.6-2.0	0.09-0.16	5.1-6.5	Low----------	0.28	
	18-54	<0.2	0.01-0.03	5.6-8.4	Low----------	0.28	
	54-70	<0.2	0.01-0.03	5.6-8.4	Low----------	0.28	
FAC----------	0-8	0.6-2.0	0.11-0.19	5.1-6.5	Low----------	0.32	2
Farmington	8-19	0.6-2.0	0.07-0.18	5.6-7.8	Low----------	0.28	
	19	---	---	---	----------	----	
Fd----------	0-6	0.6-2.0	0.12-0.20	5.6-7.3	Low----------	0.24	3
Fredon	6-24	0.2-2.0	0.12-0.20	5.6-7.3	Low----------	0.24	
	24-60	2.0-20	0.02-0.06	6.1-8.4	Low----------	0.17	
Ha----------	0-6	0.6-2.0	0.14-0.24	5.6-7.3	Low----------	0.24	5
Halsey	6-22	0.2-2.0	0.12-0.18	5.6-7.3	Low----------	0.32	
	22-60	2.0-20	0.02-0.07	6.1-8.4	Low----------	0.20	
HH*.							
Histic							
Humaquepts							
HLC*, HLD*-------	0-4	0.6-6.0	0.10-0.21	4.5-6.0	Low----------	0.20	2
Hollis	4-14	0.6-6.0	0.06-0.18	4.5-6.0	Low----------	0.43	
	14	---	---	---	----------	----	
HoA, HoB, HoC,							
HoD----------	0-6	2.0-6.0	0.05-0.12	4.5-5.5	Low----------	0.17	3-2
Hoosic	6-22	2.0-20	0.05-0.11	4.5-5.5	Low----------	0.17	
	22-60	>20	0.01-0.05	5.1-6.0	Low----------	0.17	
LdB, LdC----------	0-6	0.6-2.0	0.11-0.17	4.5-6.5	Low----------	0.24	3
Lordstown	6-37	0.6-2.0	0.10-0.16	4.5-6.0	Low----------	0.28	
Ma----------	0-10	0.2-0.6	0.16-0.21	5.1-7.8	Moderate--------	0.49	3
Madalin	10-38	0.06-0.2	0.12-0.13	5.6-7.8	Moderate--------	0.28	
	38-60	<0.2	0.12-0.13	7.4-8.4	Moderate--------	0.28	

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
MdB, MdC, MdD, MNE*----------	0-8	0.6-2.0	0.09-0.14	3.6-6.5	Low----------	0.24	3
Mardin	8-20	0.6-2.0	0.09-0.16	3.6-6.5	Low----------	0.28	
	20-60	<0.2	0.01-0.03	4.5-7.3	Low----------	0.28	
My----------	0-11	0.6-2.0	0.14-0.21	5.1-6.5	Low----------	0.49	3
Middlebury	11-42	0.6-2.0	0.10-0.20	5.6-7.3	Low----------	0.49	
	42-60	>6.0	0.01-0.10	5.6-7.3	Low----------	0.17	
NaD----------	0-10	0.6-2.0	0.08-0.16	4.5-5.5	Low----------	0.20	2
Nassau	10-18	0.6-2.0	0.07-0.12	4.5-5.5	Low----------	0.20	
	18	---	---	---	----------	----	
OkA, OkB----------	0-8	6.0-20	0.09-0.11	5.6-7.3	Low----------	0.15	5
Oakville	8-60	>20	0.06-0.08	5.6-7.3	Low----------	0.15	
OtB, OtC, OtD----	0-6	6.0-20.0	0.05-0.12	3.6-5.5	Low----------	0.17	3-2
Otisville	6-28	6.0-20.0	0.02-0.05	3.6-5.5	Low----------	0.17	
	28-60	>6.0	0.01-0.02	4.5-6.0	Low----------	0.17	
OVE*:							
Otisville-------	0-6	6.0-20.0	0.05-0.12	3.6-5.5	Low----------	0.17	3-2
	6-28	6.0-20.0	0.02-0.05	3.6-5.5	Low----------	0.17	
	28-60	>6.0	0.01-0.02	4.5-6.0	Low----------	0.17	
Hoosic----------	0-6	2.0-6.0	0.05-0.12	4.5-5.5	Low----------	0.17	3-2
	6-22	2.0-20	0.05-0.11	4.5-5.5	Low----------	0.17	
	22-60	>20	0.01-0.05	5.1-6.0	Low----------	0.17	
Pa, Pb----------	0-25	0.2-6.0	0.35-0.45	5.1-8.4	----------	----	---
Palms	25-60	0.2-2.0	0.14-0.22	6.1-8.4	Low----------	----	
Pg*.							
Pits							
PtB, PtC, PtD----	0-10	2.0-6.0	0.12-0.18	4.5-7.3	Low----------	0.24	3
Pittsfield	10-34	2.0-6.0	0.11-0.18	5.1-7.3	Low----------	0.24	
	34-60	0.6-6.0	0.09-0.17	5.6-8.4	Low----------	0.24	
Qu*.							
Quarries							
Ra----------	0-8	0.6-2.0	0.20-0.25	5.1-7.3	Low----------	0.49	3
Raynham	8-26	0.2-2.0	0.18-0.22	5.1-7.3	Low----------	0.64	
	26-60	0.06-0.2	0.18-0.22	5.6-7.8	Low----------	0.64	
RbA, RbB----------	0-11	0.2-0.6	0.16-0.21	5.1-7.3	Moderate-------	0.49	3
Rhinebeck	11-45	0.06-0.2	0.12-0.14	5.1-7.8	Moderate-------	0.28	
	45-60	0.06-0.2	0.12-0.14	6.1-8.4	Moderate-------	0.28	
RhA, RhB, RhC, RhD----------	0-9	2.0-6.0	0.16-0.18	4.5-5.5	Low----------	0.28	3
Riverhead	9-26	2.0-6.0	0.09-0.13	4.5-5.5	Low----------	0.24	
	26-30	2.0-6.0	0.04-0.13	4.5-5.5	Low----------	0.17	
	30-60	>20	0.02-0.04	4.5-7.3	Low----------	0.17	
RKC*, RKD*, RKF*:							
Rock outcrop.							
Arnot----------	0-4	0.6-2.0	0.10-0.15	3.6-6.0	Low----------	0.24	2-1
	4-15	0.6-2.0	0.08-0.12	3.6-6.0	Low----------	0.17	
	15	---	---	---	----------	----	
RMC*, RMD*:							
Rock outcrop.							

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
RMC*, RMD*:							
Farmington------	0-8	0.6-2.0	0.11-0.19	5.1-6.5	Low----------	0.32	2
	8-19	0.6-2.0	0.07-0.18	5.6-7.8	Low----------	0.28	
	19	---	---	---	----------	----	
ROC*, ROD*:							
Rock outcrop.							
Hollis----------	0-4	0.6-6.0	0.10-0.21	4.5-6.0	Low----------	0.20	2
	4-14	0.6-6.0	0.06-0.18	4.5-6.0	Low----------	0.43	
	14	---	---	---	----------	----	
ROF*:							
Rock outcrop.							
Hollis----------	0-2	0.6-6.0	0.10-0.21	4.5-6.0	Low----------	0.20	2
	2-15	0.6-6.0	0.06-0.18	4.5-6.0	Low----------	0.43	
	15	---	---	---	----------	----	
RSB*, RSD*, RSF*:							
Rock outcrop.							
Nassau----------	0-10	0.6-2.0	0.08-0.16	4.5-5.5	Low----------	0.20	2
	10-18	0.6-2.0	0.07-0.12	4.5-5.5	Low----------	0.20	
	18	---	---	---	----------	----	
Sb---------------	0-11	>6.0	0.10-0.23	4.5-6.0	Low----------	0.17	3
Scarboro	11-15	>6.0	0.01-0.13	4.5-6.0	Low----------	0.10	
	15-60	>6.0	0.01-0.13	4.5-6.0	Low----------	0.10	
ScA, ScB---------	0-8	0.6-2.0	0.18-0.21	4.5-6.0	Low----------	0.49	3
Scio	8-35	0.6-2.0	0.17-0.20	4.5-6.0	Low----------	0.64	
	35-60	2.0-20.0	0.02-0.19	5.1-7.8	Low----------	0.17	
Su---------------	0-4	>6.0	0.07-0.15	4.5-6.5	Low----------	----	---
Suncook	4-60	>6.0	0.01-0.13	4.5-6.5	Low----------	----	
SwB, SwC, SwD----	0-1	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.17	3-2
Swartswood	1-31	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.28	
	31-70	0.06-0.6	0.06-0.10	3.6-5.5	Low----------	0.28	
SXC*, SXD*, SXF*:							
Swartswood------	0-1	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.17	3-2
	1-31	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.28	
	31-70	0.06-0.6	0.06-0.10	3.6-5.5	Low----------	0.28	
Mardin----------	0-8	0.6-2.0	0.11-0.17	3.6-6.5	Low----------	0.24	3
	8-20	0.6-2.0	0.09-0.16	3.6-6.5	Low----------	0.28	
	20-60	<0.2	0.01-0.03	4.5-7.3	Low----------	0.28	
Tg---------------	0-3	0.6-6.0	0.15-0.21	5.1-7.3	Low----------	0.49	4
Tioga	3-40	0.6-6.0	0.07-0.20	5.1-7.3	Low----------	0.37	
	40-60	0.6-20	0.02-0.20	5.6-7.8	Low----------	0.37	
UF*:							
Udifluvents.							
Fluvaquents.							
UH*.							
Udorthents							
UnB, UnC---------	0-8	0.6-2.0	0.18-0.21	4.5-6.0	Low----------	0.49	3
Unadilla	8-44	0.6-2.0	0.17-0.20	4.5-6.0	Low----------	0.64	
	44-60	2.0-20.0	0.01-0.07	5.1-7.8	Low----------	0.17	
Ur*.							
Urban land							

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
Wa	0-9	0.6-2.0	0.16-0.21	5.1-7.3	Low	0.49	3
Wallkill	9-18	0.6-2.0	0.15-0.20	5.1-7.3	Low	0.43	
	18-60	2.0-20	0.19-0.22	5.6-7.3	Low	----	
Wd	0-9	0.2-2.0	0.17-0.22	5.1-7.8	Low	0.49	3
Wayland	9-47	0.06-0.2	0.16-0.20	5.1-8.4	Low	0.49	
	47-60	0.06-0.2	0.08-0.19	5.6-8.4	Low	0.49	
WuB, WuC	0-1	0.6-2.0	0.10-0.14	3.6-5.5	Low	0.17	3-2
Wurtsboro	1-23	0.6-2.0	0.10-0.14	3.6-5.5	Low	0.28	
	23-60	0.06-0.2	0.08-0.12	3.6-5.5	Low	0.28	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ab, AC*---------- Alden	D	None---------	---	---	0-0.5	Perched	Nov-Jun	>60	---	High-----	High-----	Low.
AdA, AdB---------- Allard	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
ANC*, AND*, ANF*: Arnot-----------	C/D	None---------	---	---	1.0-1.5	Perched	Apr-May	10-20	Hard	Moderate	Low------	High.
Lordstown--------	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	Low------	High.
Ba---------------- Barbour	B	Occasional	Brief to long.	Dec-Apr	3.0-6.0	Apparent	Jan-Apr	>60	---	Moderate	Low------	Moderate.
Be---------------- Basher	B	Occasional	Brief to long.	Dec-Apr	1.5-2.0	Apparent	Jan-May	>60	---	High-----	Moderate	Moderate.
BnB*, BnC*: Bath-----------	C	None---------	---	---	2.0-4.0	Perched	Nov-Mar	48-60	Hard	Moderate	Moderate	Moderate.
Nassau-----------	C	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
Ca---------------- Canandaigua	D	None to rare	---	---	0-0.5	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Cd, Ce, Cf-------- Carlisle	A/D	Frequent----	Long------	Nov-May	0-1.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
CgA, CgB---------- Castile	B	None---------	---	---	1.5-2.0	Apparent	Mar-May	>60	---	High-----	Moderate	Moderate.
ChB, ChC---------- Charlton	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
CLC*, CLD*: Charlton---------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Paxton-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
CnA, CnB, CnC----- Chenango	A	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
CoB, CoC, CoD----- Collamer	C	None---------	---	---	1.5-2.0	Apparent	Mar-May	>60	---	High-----	Moderate	Low.
Du*. Dumps												
ErA, ErB---------- Erie	C	None---------	---	---	0.5-1.5	Perched	Dec-May	>60	---	High-----	High-----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
ESB*---------- Erie	C	None--------	---	---	0.5-1.5	Perched	Dec-May	>60	---	High-----	---	Low.
FAC---------- Farmington	C	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	Moderate.
Fd---------- Fredon	C	None--------	---	---	0-1.5	Apparent	Oct-Jun	>60	---	High-----	Low------	Low.
Ha---------- Halsey	D	None to rare	---	---	0-0.5	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
HH*. Histic Humaquepts												
HLC*, HLD*-------- Hollis	C/D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
HoA, HoB, HoC, HoD---------- Hoosic	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
LdB, LdC---------- Lordstown	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Low------	High.
Ma---------- Madalin	D	None--------	---	---	0-0.5	Apparent	Dec-May	>60	---	Moderate	High-----	Low.
MdB, MdC, MdD, MNE*---------- Mardin	C	None--------	---	---	1.5-2.0	Perched	Mar-May	>60	---	Moderate	Moderate	Low.
My---------- Middlebury	B	Common------	Brief-----	Nov-May	0.5-2.0	Apparent	Feb-Apr	>60	---	High-----	Moderate	Low.
NaD---------- Nassau	C	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
OkA, OkB---------- Oakville	A	None--------	---	---	>3.0	Apparent	Nov-Apr	>60	---	Low------	Low------	Moderate.
OtB, OtC, OtD----- Otisville	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
OVE*: Otisville--------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Hoosic----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Pa, Pb---------- Palms	A/D	Frequent----	Long------	Nov-May	0-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
Pg*. Pits												

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
PtB, PtC, PtD----- Pittsfield	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Qu*. Quarries												
Ra---------- Raynham	C	None--------	---	---	0.5-2.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Moderate.
RbA, RbB---------- Rhinebeck	D	None--------	---	---	0.5-1.5	Perched	Jan-May	>60	---	Moderate	High-----	Low.
RhA, RhB, RhC, RhD---------- Riverhead	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
RKC*, RKD*, RKF*: Rock outcrop.												
Arnot----------	C/D	None--------	---	---	1.0-1.5	Perched	Apr-May	10-20	Hard	Moderate	Low------	High.
RMC*, RMD*: Rock outcrop.												
Farmington-------	C	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	Moderate.
ROC*, ROD*, ROF*: Rock outcrop.												
Hollis----------	C/D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
RSB*, RSD*, RSF*: Rock outcrop.												
Nassau----------	C	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
Sb---------- Scarboro	D	Rare--------	---	---	0-1.0	Apparent	Jan-Dec	>60	---	Moderate	High-----	High.
ScA---------- Scio	B	None to rare	---	---	1.5-2.0	Apparent	Mar-May	>60	---	High-----	Moderate	Moderate.
ScB---------- Scio	B	None--------	---	---	1.5-2.0	Apparent	Mar-May	>60	---	High-----	Moderate	Moderate.
Su---------- Suncook	A	Common------	Brief-----	Mar-May	3.0-6.0	Apparent	Jan-Apr	>60	---	Low------	Low------	High.
SwB, SwC, SwD----- Swartswood	C	None--------	---	---	2.0-4.0	Perched	Nov-Mar	>60	---	Moderate	Low------	High.
SXC*, SXD*, SXF*: Swartswood-------	C	None--------	---	---	2.0-4.0	Perched	Nov-Mar	>60	---	Moderate	Low------	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
SXC*, SXD*, SXF*: Mardin	C	None	---	---	1.5-2.0	Perched	Mar-May	>60	---	Moderate	Moderate	Low.
Tg Tioga	B	Common	Brief	Nov-May	3.0-6.0	Apparent	Feb-Apr	>60	---	Moderate	Low	Moderate.
UF*: Udifluvents.												
Fluvaquents.												
UH*. Udorthents												
UnB, UnC Unadilla	B	None	---	---	>6.0	---	---	>60	---	High	Low	Moderate.
Ur*. Urban land												
Wa Wallkill	D	Frequent	Brief to long.	Sep-Jun	0-0.5	Apparent	Sep-Jun	>60	---	High	Moderate	Moderate.
Wd Wayland	D	Frequent	Brief to long.	Nov-Jun	0.0-0.5	Apparent	Nov-Jun	>60	---	High	High	Low.
WuB, WuC Wurtsboro	C	None	---	---	1.0-3.0	Perched	Nov-Mar	>60	---	Moderate	High	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution											Moisture density		
			Percentage passing sieve--							Percentage smaller than--						
	AASHTO	Unified	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm	Liquid limit	Plasticity index	Max. dry density	Optimum moisture	Linear shrinkage
													Pct		Lb/Ft^3	Pct	Pct
Wurtsboro gr-l:[1] (S73NY-036-008)																	
B21-------1 to 9	A-4 (00)	SM	98	90	84	78	72	62	43	20	0	0	--	NP	101	20	3.4
B22-------9 to 20	A-4 (00)	SM	100	88	83	78	71	59	38	21	0	0	21	3	124	11	2.0
B'x------23 to 59	A-4 (00)	SM	98	90	84	78	72	62	37	19	0	0	13	1	133	8	1.0
Bath sh-sil:[2] (S73NY-036-004)																	
Ap--------0 to 9	A-4 (01)	ML	100	94	85	75	68	58	51	30	0	0	39	5	102	18	4.4
B21-------9 to 16	A-4 (01)	ML	100	96	91	85	79	70	63	36	0	0	27	4	111	16	3.6
B22------16 to 26	A-4 (00)	CL-ML	99	91	85	79	71	62	54	32	0	0	23	4	119	13	2.4
B'x------29 to 53	A-1-B(00)	GM	99	82	70	59	48	33	21	11	0	0	18	2	132	9	1.6
Oakville lfs:[3] (S73NY-036-009)																	
Ap--------0 to 8	A-2-4(00)	SM	100	100	100	100	100	83	15	--	0	0	--	NP	112	12	0.0
B21-------8 to 24	A-2-4(00)	SM	100	100	100	100	100	80	13	--	0	0	--	NP	114	11	0.0
B22------24 to 36	A-3 (01)	SP-SM	100	100	100	100	100	81	6	--	0	0	--	NP	107	13	0.0
B3-------36 to 48	A-3 (01)	SP-SM	100	100	100	100	100	95	5	--	0	0	--	NP	104	17	0.0
C--------48 to 60	A-3 (01)	SP	100	100	100	100	100	99	3	--	0	0	--	NP	99	17	0.0
Swartswood gr-l:[4] (S73NY-036-007)																	
B21------10 to 19	A-1-B(00)	GM	77	54	44	40	37	32	23	12	0	0	25	2	120	12	2.4
B22------19 to 27	A-2-4(00)	SM	97	80	73	69	64	53	31	16	0	0	15	1	133	8	1.0
B'x------31 to 62	A-4 (00)	SM	98	91	86	80	74	63	40	22	0	0	15	1	133	8	1.0
C--------62 to 80	A-2-4(00)	SM	99	88	82	74	68	57	35	19	0	0	15	1	131	9	1.0

[1]Wurtsboro gravelly loam:
Town of Deerpark, 30 feet west of Prospect Hill Road, 100 feet east of Big Pond Road.

[2]Bath shaly silt loam:
Town of Minisink, 2,000 feet east of Lower Road, 25 feet south of Stateline Road.

[3]Oakville loamy fine sand:
Town of Deerpark, 500 feet west of Route 209, 50 feet north of Huguenot Estate Park.

[4]Swartswood gravelly loam:
Town of Deerpark, 25 feet south of Prospect Hill Road, 500 feet east of Big Pond Road.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Alden	Fine-loamy, mixed, nonacid, mesic Mollic Haplaquepts
Allard	Coarse-silty over sandy or sandy-skeletal, mixed, mesic Typic Dystrochrepts
Arnot	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Barbour	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Fluventic Dystrochrepts
Basher	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Bath	Coarse-loamy, mixed, mesic Typic Fragiochrepts
*Canandaigua	Fine-silty, mixed, nonacid, mesic Mollic Haplaquepts
Carlisle	Euic, mesic Typic Medisaprists
*Castile	Loamy-skeletal, mixed, mesic Aquic Dystrochrepts
Charlton	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Chenango	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Collamer	Fine-silty, mixed, mesic Glossoboric Hapludalfs
Erie	Coarse-loamy, mixed, mesic Aeric Fragiaqualfs
Farmington	Loamy, mixed, mesic Lithic Eutrochrepts
Fredon	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic Aeric Haplaquepts
Halsey	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic Mollic Haplaquepts
Hollis	Loamy, mixed, mesic Lithic Dystrochrepts
Hoosic	Sandy-skeletal, mixed, mesic Typic Dystrochrepts
Lordstown	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Madalin	Fine, illitic, mesic Mollic Ochraqualfs
Mardin	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Middlebury	Coarse-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Nassau	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Oakville	Mixed, mesic Typic Udipsamments
Otisville	Sandy-skeletal, mixed, mesic Typic Udorthents
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Paxton	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Pittsfield	Coarse-loamy, mixed, mesic Dystric Eutrochrepts
Raynham	Coarse-silty, mixed, nonacid, mesic Aeric Haplaquepts
Rhinebeck	Fine, illitic, mesic Aeric Ochraqualfs
Riverhead	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Scarboro	Sandy, mixed, mesic Histic Humaquepts
Scio	Coarse-silty, mixed, mesic Aquic Dystrochrepts
Suncook	Mixed, mesic Typic Udipsamments
Swartswood	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Tioga	Coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Unadilla	Coarse-silty, mixed, mesic Typic Dystrochrepts
Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Wayland	Fine-silty, mixed, nonacid, mesic Mollic Fluvaquents
Wurtsboro	Coarse-loamy, mixed, mesic Typic Fragiochrepts

TABLE 20.--SOIL CATENAS

Parent material and soil characteristics	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
	SOILS ON TILL PLAINS					
Deep, moderately coarse textured and medium textured, brownish glacial till derived from limestone and schist.		Pittsfield				
Deep, moderately coarse textured and medium textured, brownish glacial till derived from schist and gneiss.		Charlton				
Deep, moderately coarse textured and medium textured, brownish glacial till derived from schist and gneiss. Fragipan.		Paxton				
Deep, medium textured, brownish glacial till derived from sandstone, shale, and slate. Fragipan.		Bath	Mardin	Erie		
Deep, moderately coarse textured and medium textured, brownish glacial till derived from quartzite, conglomerate, and sandstone.						
Fragipan at a depth of 25 to 35 inches		Swartswood	Swartswood			
Fragipan at a depth of 18 to 25 inches			Wurtsboro	Wurtsboro		
Deep, medium textured and moderately fine textured grayish and brownish glacial till derived from shale, sandstone, and some limestone; mantled with silty colluvial sediment.						Alden
Moderately deep, medium textured, brownish glacial till derived from sandstone and some shale and slate; over sandstone bedrock.		Lordstown				
Shallow, medium textured, brownish glacial till derived from sandstone and shale; over sandstone bedrock.	Arnot	Arnot	Arnot			
Shallow, medium textured, brownish glacial till derived from limestone, shale, slate, and siltstone; over limestone or alkaline shale bedrock.		Farmington				
Shallow, moderately coarse textured and medium textured, brownish glacial till derived from schist, gneiss, and granite; over granitic bedrock.	Hollis	Hollis				
Shallow, medium textured, brownish glacial till derived from slate and shale; over slate or shale bedrock.	Nassau					
	SOILS ON LACUSTRINE PLAINS					
Clayey, grayish, glaciolacustrine deposits.				Rhinebeck	Madalin	Madalin
Silty, brownish, glaciolacustrine deposits.		Collamer			Canandaigua	Canandaigua
Coarse-silty, brownish, glaciolacustrine deposits.		Unadilla	Scio	Raynham	Raynham	

See footnote at end of table.

TABLE 20.--SOIL CATENAS--Continued

Parent material and soil characteristics	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
	SOILS ON OUTWASH PLAINS, TERRACES, AND DELTAS					
Medium textured, brownish, glaciofluvial material over stratified sand and gravel.	Chenango	Chenango	Castile	Fredon	Fredon	Halsey
Moderately coarse textured, brownish, glaciofluvial material over sand and gravel.	Hoosic		Castile	Fredon	Fredon	Halsey
Coarse textured, brownish glaciofluvial material over sand and gravel.	Otisville*					
Coarse textured, brownish, glaciofluvial material over fine and medium sand.		Oakville				Scarboro
Moderately coarse textured, brownish, glaciofluvial sandy material over stratified sand and gravel or sand.		Riverhead				Scarboro
Medium textured, brownish glaciofluvial silty material over stratified sand or sand and gravel.		Allard				
	SOILS ON FLOOD PLAINS					
Medium textured, brownish, alluvial sediment.		Tioga	Middlebury	Middlebury	Wayland	Wayland
Medium textured, reddish, alluvial sediment.		Barbour	Basher	Basher		
Coarse textured, brownish, alluvial sediment.	Suncook*					
Medium textured, brownish, alluvial sediment over organic material.						Wallkill
	SOILS IN SWAMPS AND BOGS					
Organic material more than 51 inches thick.						Carlisle
Organic material 16 to 50 inches thick over loamy mineral material.						Palms

* These soils are mostly excessively drained.

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