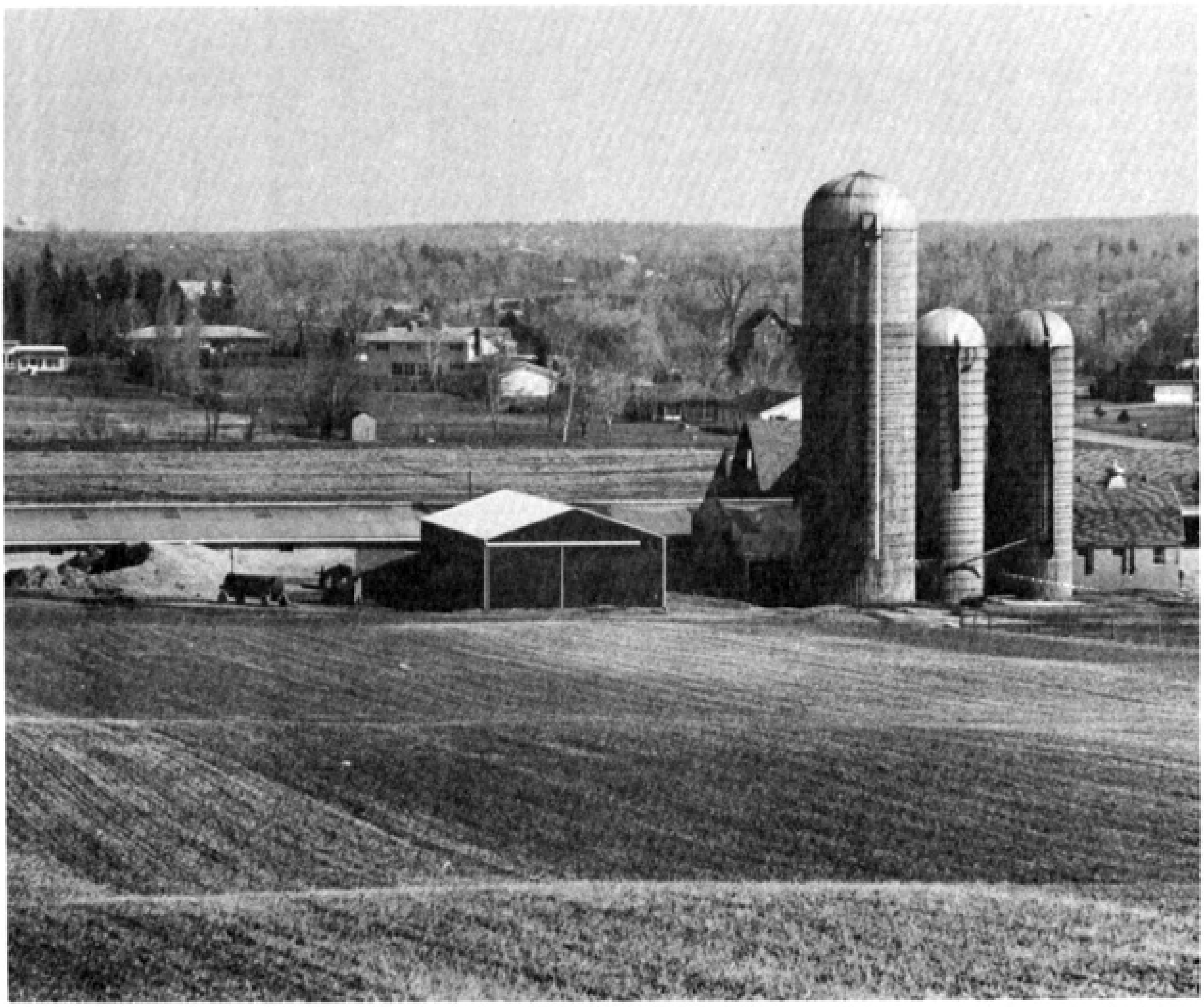
United States
Department of
Agriculture

Soil
Conservation
Service

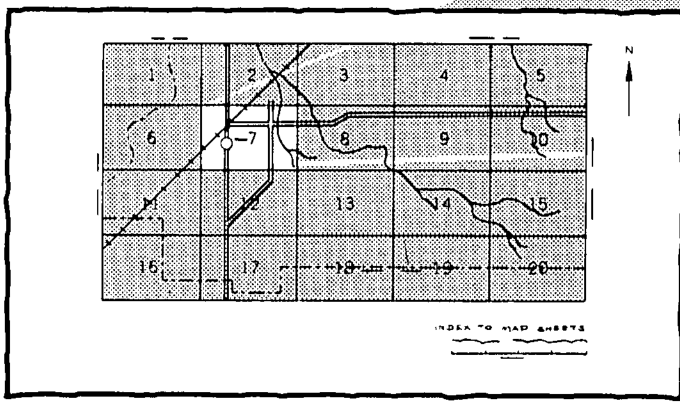
In Cooperation with
the Cornell University
Agricultural
Experiment Station

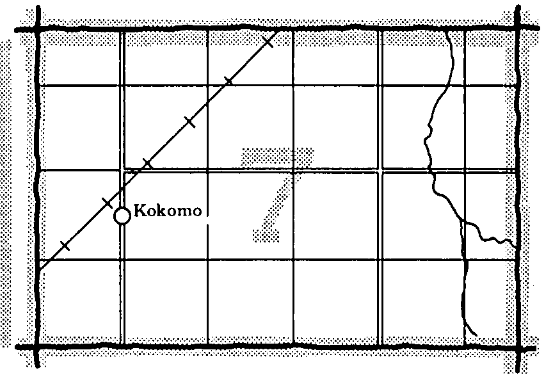
Soil Survey of Erie County, New York



HOW TO USE

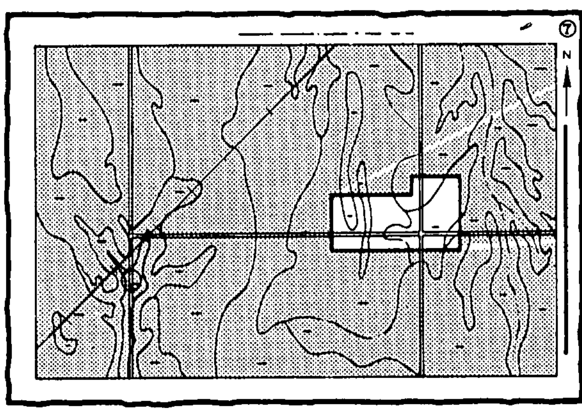
1. Locate your area of interest on the "Index to Map Sheets."

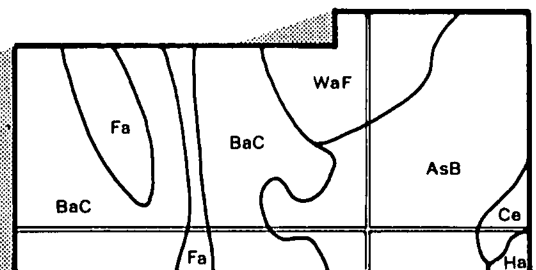




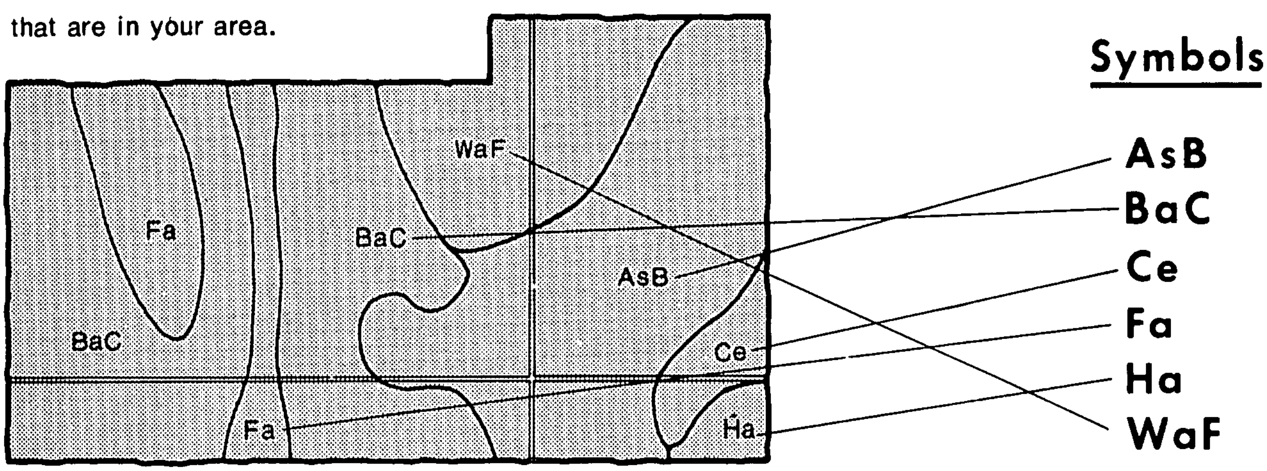
2. Note the number of the map sheet and turn to that sheet.

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



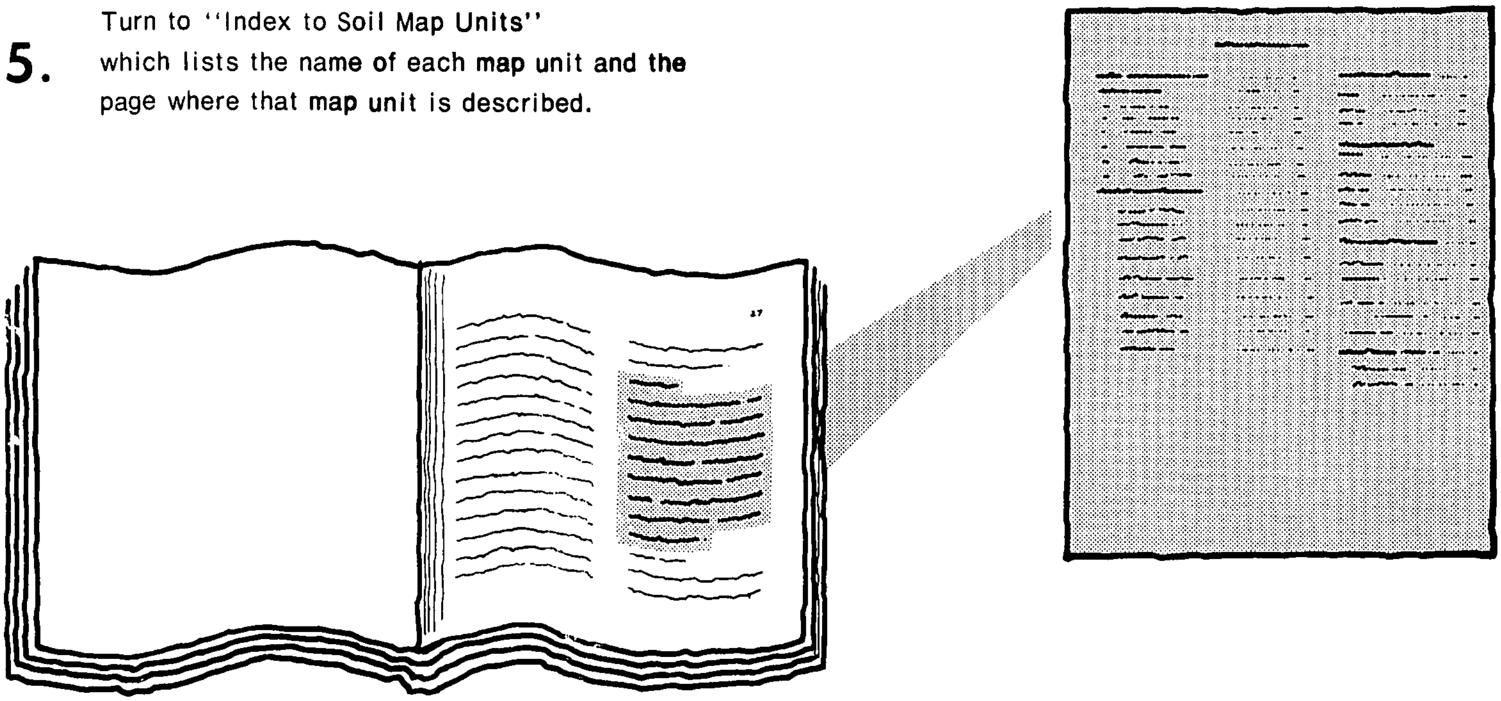


4. List the map unit symbols that are in your area.

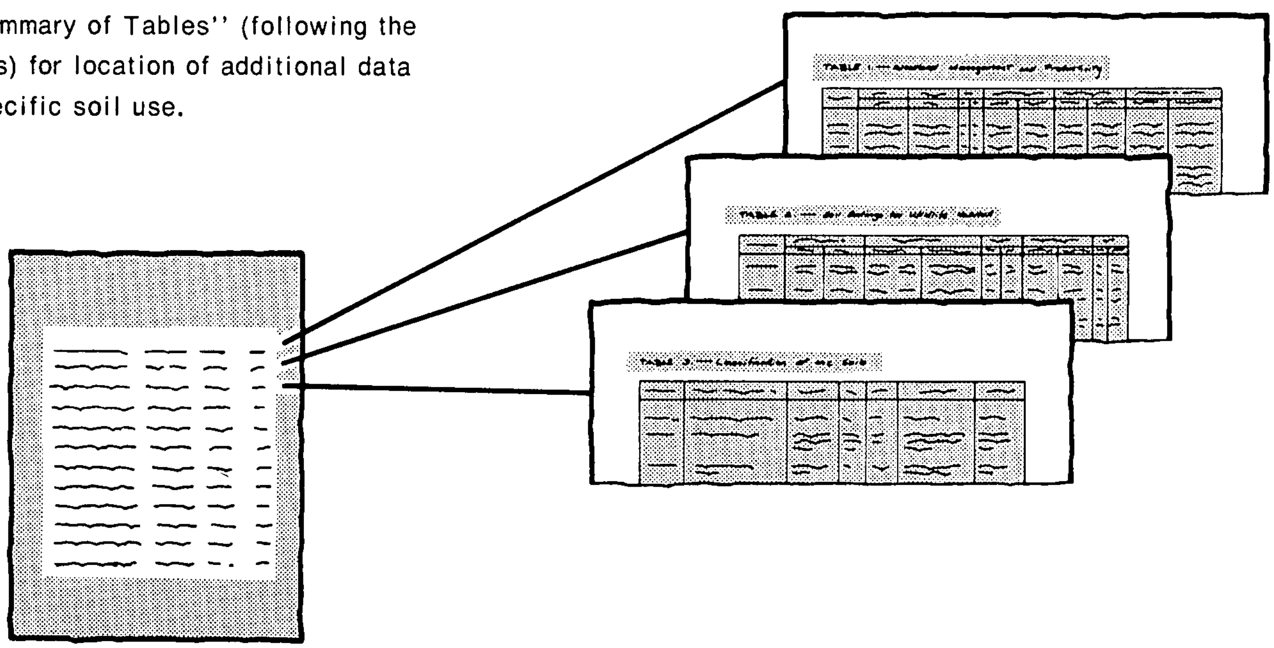


THIS SOIL SURVEY

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 1967-77. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service and the Cornell University Agricultural Experiment Station. It is part of the technical assistance furnished to the Erie County Soil and Water Conservation District. Partial funding for the survey was provided by the Erie County Legislature through the Erie 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: Hay and pasture on Orpark soils in the foreground; homesites on Blasdell soils in background.

contents

soil series

Issued December 1986

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foreword

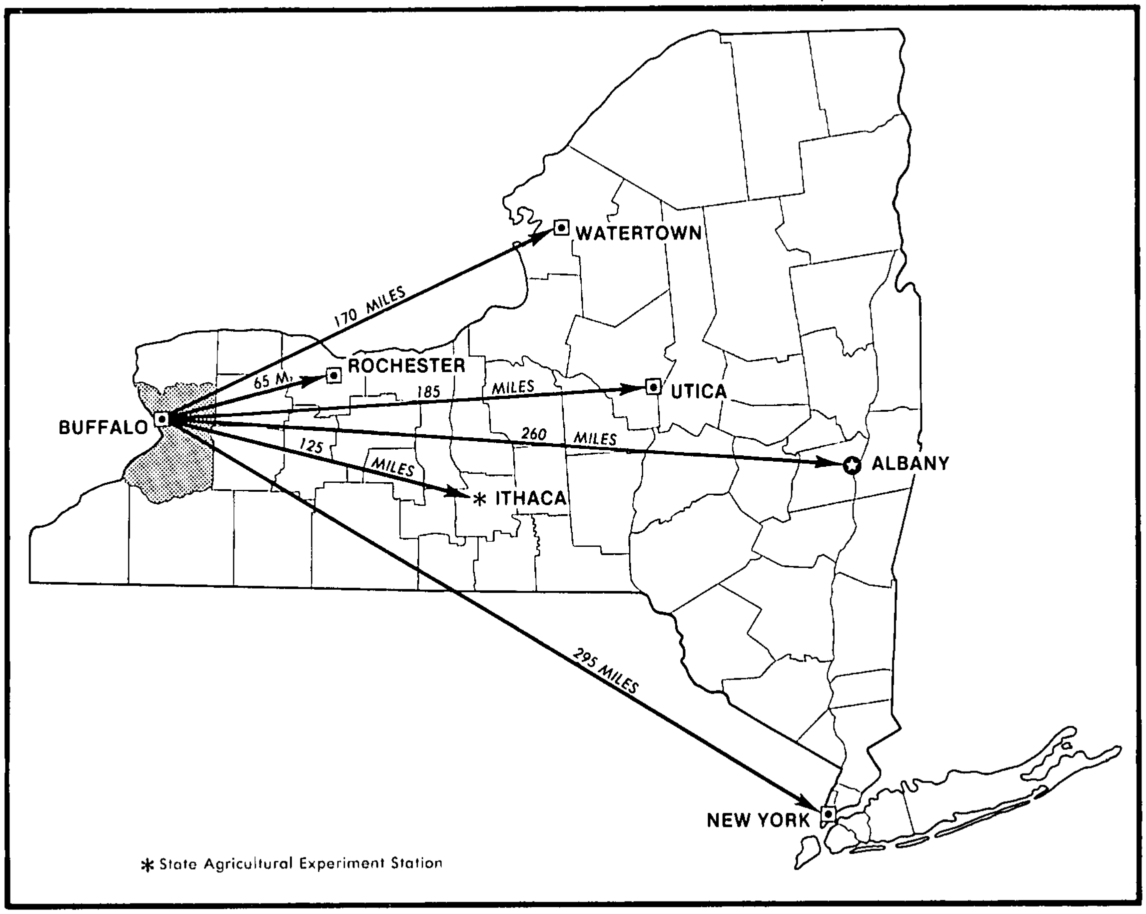
This soil survey contains information that can be used in land-planning programs in Erie County, New York. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the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

Paul A. Dodd
State Conservationist
Soil Conservation Service



Location of Erie County in New York

soil survey of
Erie County, New York

By Donald W. Owens, Cornell University Agricultural Experiment Station,
and Willie L. Pittman, John P. Wulforst, and Willis E. Hanna,
Soil Conservation Service

Soils surveyed by John P. Wulforst, Gerald B. Brauen, Willie L. Pittman, Willis E. Hanna, Randall F. Brown, and Arthur H. Hanson, Soil Conservation Service; and Donald W. Owens and Leroy Daugherty, Cornell University Agricultural Experiment Station

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

ERIE COUNTY borders the northeast shore of Lake Erie along the western edge of New York State. It is bounded on the north by Niagara County, on the east by Genesee and Wyoming Counties, and on the south by Cattaraugus and Chautauqua Counties. The northwest corner of the county is separated from Canada by the Niagara River.

Erie County is roughly rectangular. It is about 43 miles from north to south and averages 24 miles from east to west. The county has a total area of 657,965 acres, or approximately 1,028 square miles. Buffalo, the second largest city in New York, is the county seat.

The county's strong industrial and agricultural base gives it both an urban and rural character. According to the 1974 Census of Agriculture, about 31 percent of the land area in the county is in active farms (*12*). Of the area in farmland, about 60 percent is cropland, 15 percent is pasture, and 15 percent is farm woodlots. The principal agricultural enterprise is dairying; however, substantial areas are used for vegetable crops, cash crops, and vineyards. A few areas are in orchards, horse farms, beef operations, and poultry farms. Corn and hay crops occupy the largest acreage, mainly in the dairy areas. About 1.5 percent of the cropland is irrigated, mostly in the vegetable growing region. Production of maple syrup is important in the southern part of the county. A large acreage in the central and northern part of the county that was once farmed is now developed for urban and suburban uses.

Many of the soils in the county are suited to a wide variety of farm and nonfarm uses. The main exceptions are the organic soils, very wet soils, shallow soils, and steep soils. Improvement of natural drainage is the principal soil management problem on the Erie-Ontario lowland plain in the northern and western parts of the county. Erosion is a problem on hillsides and valley sides in the Allegheny Plateau uplands in the central and southern parts of the county. The fringe area between the upland plateau and lowland plain is dominated by shallow and moderately deep soils that require careful management for most uses.

general nature of the county

This section provides general information about Erie County. It discusses climate, physiography and geology, drainage, and water supply.

climate

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

Erie County is cold and snowy in winter and moderately warm in summer. The areas nearest Lake Erie are markedly cooler in summer than the rest. Precipitation is well distributed during the year and is adequate for most crops. From late fall through winter, snow squalls are frequent and the total snowfall is normally heavy. In some years a single prolonged storm can produce more than 2 feet of snow, and strong winds create deep drifts.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Buffalo in the period 1951 to 1977. 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 26 degrees F, and the average daily minimum temperature is 20 degrees. The lowest temperature on record, which occurred at Buffalo on February 2, 1961, is -20 degrees. In summer the average temperature is 69 degrees, and the average daily maximum temperature is 78 degrees. The highest recorded temperature, which occurred at Buffalo on September 3, 1953, is 98 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 37 inches. Of this, 18.5 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 16 inches. The heaviest 1-day rainfall during the period of record was 3.9 inches at Buffalo on August 7, 1963. Thunderstorms occur on about 31 days each year, and most occur in summer.

Average seasonal snowfall is 97 inches. The greatest snow depth at any one time during the period of record was 42 inches. On an average of 45 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 65 percent of the time possible in summer and 30 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 14 miles per hour, in winter.

Crop development early in the growing season is slowed by frequent cool winds off a cold lake. This slowing is important to fruit crops, which usually do not blossom until after most chance of a spring freeze is past. Fall winds, which blow off a relatively warm lake, delay the first fall freeze and prolong the growing season for all crops.

physiography and geology

Bernard S. Ellis, senior staff geologist, Soil Conservation Service, assisted in the preparation of this section.

Erie County is in two physiographic provinces. The northern half and the western edge of the county are in the Erie-Ontario lake plain province; the southern part is in the Allegheny Plateau province. The Erie-Ontario Plain has little significant relief, except in the immediate vicinity of the major drainageways. The Erie-Ontario Plain typifies the topography of an abandoned lakebed. But on its southern and eastern boundaries, which are mostly formed by old glacial lake beaches, the topography rapidly changes to that of the Allegheny Plateau. In this section, steep valley walls are commonplace, and wide ridgetops and flat-topped hills occur between the drainageways.

Elevations range from a low of 569 feet above mean sea level at the Lake Erie shoreline to a high of 1,935 feet above mean sea level approximately 6 miles northeast of Springville. This is relatively high country for New York State. With the exception of the Adirondack and Catskill Mountains, very few areas in New York reach an elevation of 2,000 feet. On the Erie-Ontario Plain, elevation ranges from 700 to 1,000 feet. On the Allegheny Plateau, elevation rises rapidly to 1,300 to 1,500 feet and then slowly to 1,900 feet or more in the southeastern corner of the county.

Erie County is underlain by bedrock of the Upper Silurian and the Middle and Upper Devonian periods (*3*). The various formations of rock are in bands that have an east-west orientation (fig. 1). The beds are oldest in the northern part of the county, and they become progressively younger toward the southern part of the county.

The oldest bedrock formation is the Salina Group, which forms a band approximately 5 to 6 miles wide along the northernmost edge of the county. This formation is composed of shale and dolomite.

Just above the Salina Group is the Akron Dolomite and Bertie Group. This formation is in a much narrower band about one-half mile wide.

The Onondaga Limestone occurs just south of the Bertie Group. This is the lowest formation of the Devonian period in this area and occasionally outcrops in a 2-mile-wide band. The Hamilton Group is above and to the south of the Onondaga Limestone. It consists of shales and limestones in a band approximately 4 miles wide.

The Hamilton Group is overlain by the Genesee Group, a narrow band of limestone and shale. This, in turn, is overlain by the shales of the Sonyea Group.

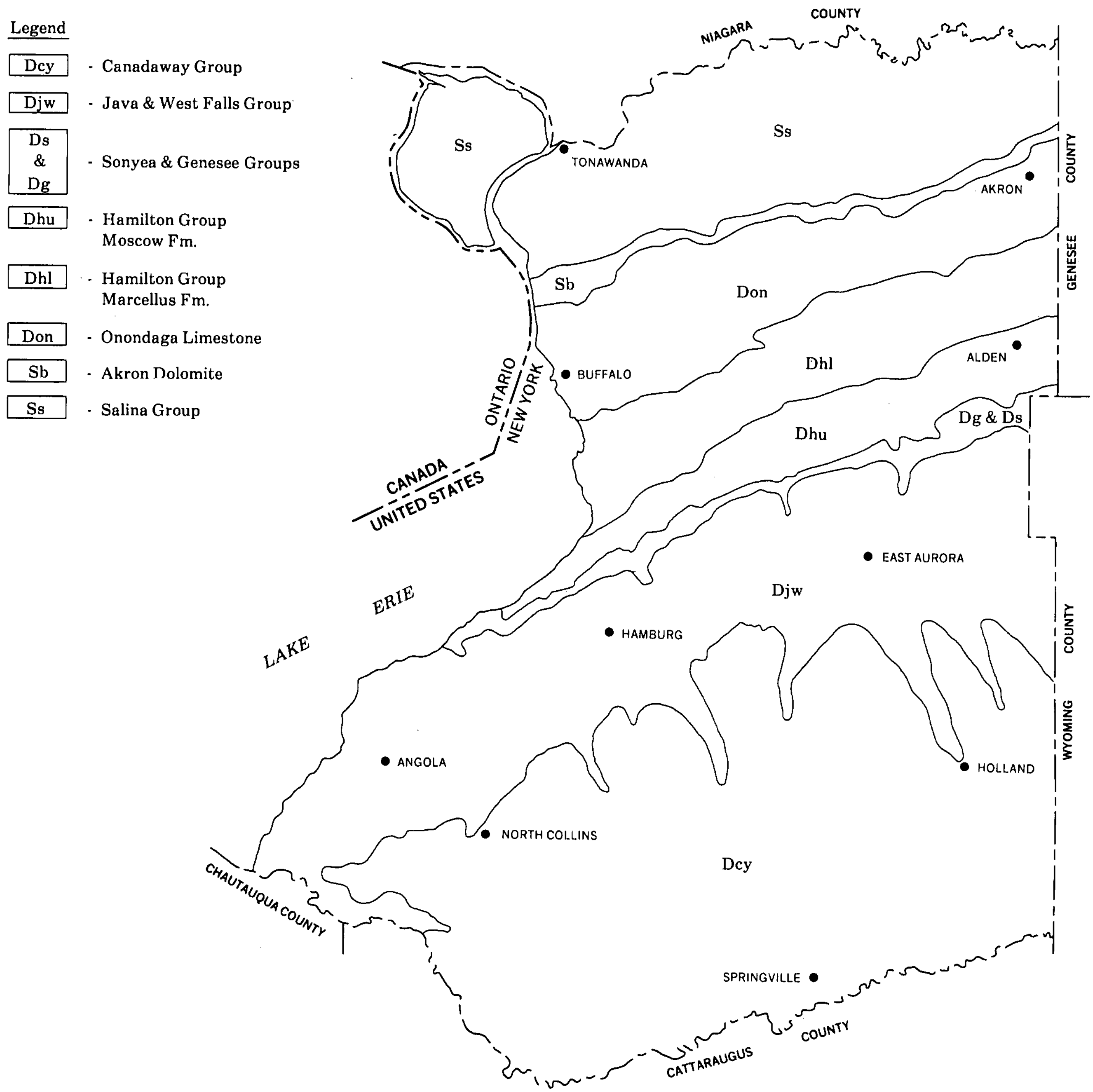


Figure 1.—Bedrock geology map of Erie County.

Above the Sonyea Group, the rather extensive sandstones and shales of the Java and West Fall Groups extend southward into the valleys at the northern edge of the Allegheny Plateau.

The Canadaway Group, consisting of shales, sandstones, and siltstones, are the youngest rocks in the county. They cover the remainder of the county to the southern border at Cattaraugus Creek.

The bedrock under the county is fairly flat but dips or tilts approximately 50 feet a mile to the southwest. The rocks have retained much of the form they had when they were deposited as silts and sands in the ancient seas that covered this area approximately 300 million years ago.

Erie County was covered and uncovered by several advances and retreats of glacial ice during the ice age that began approximately 300,000 years ago and ended about 10,000 years ago (*4*). As the ice moved southward, it picked up soil material and pieces of bedrock and ultimately redeposited a mixture of unconsolidated material of various sizes, shapes, and mineral content.

Because the deposited materials were variable, different soils formed in them. One of the more common deposits in the county is glacial till. Till is a heterogeneous mixture of particles carried by the glacier and deposited directly from it. Soils such as the Mardin and Danley soils formed in these glacial till deposits. They are located mostly in the southern part of the county, but numerous areas are also in the northern part.

Glacial lake waters occupied the northern part of the county for several fairly long periods. The sediments deposited in these lakes formed in glacial lacustrine deposits. The Niagara and Schoharie soils are the more common of several soils that formed in these fine sediments.

Water-sorted deposits associated with the melt waters from the glacial ice were laid down at various times and in various locations. Many of these deposits have been in drainageways since glaciation. The Red Hook and Palmyra soils are examples of soils that formed in these deposits.

A striking topographic feature called the Beach Ridge runs diagonally across the county. It extends from Alden on the northeast to North Collins on the southwest. This feature represents the glacial lake shore developed during many years of wave action and erosion. The Alton and Blasdell soils formed in reworked deposits in this area.

Erosion and sedimentation have been at work since the ice retreated some 10,000 years ago. Steep, fan-shaped alluvial deposits accumulated at the mouths of streams where the velocity of the water slowed and the sand and gravel dropped out of suspension. The Farnham and Chenango soils formed in these deposits. Other deposits parallel major streams in the valleys. The Hamlin and Tioga soils developed in these deposits of recent alluvium.

drainage

With the exception of Cattaraugus Creek, which forms the southern border of the county, most of the streams drain in a northwesterly to westerly direction.

Ellicott Creek is the main drainageway north of Buffalo. This stream flows in a westerly direction and empties into the Niagara River north of Buffalo. The Cayuga, Buffalo, and Cazenovia Creeks drain the central part of the county and enter Buffalo harbor just south of the city. Eighteen Mile Creek drains most of the southwestern corner of the county and enters Lake Erie approximately 15 miles southwest of Buffalo. The southern edge of the county is drained by tributaries that flow directly into Cattaraugus Creek and then into Lake Erie.

The streams north of the old glacial lake beach meander across the flat lake plains. Gradients are low, and there are numerous swampy areas. South of the beachline, the streams are somewhat entrenched. Gradients are higher, and sidewalls are dissected and steeper.

water supply

The main sources of water in Erie County are Lake Erie (and the Niagara River), wells—both dug and drilled, and surface water from streams and small impoundments (*6*).

Buffalo, Grand Island, and most of the communities along the northwest edge of the county adjacent to Lake Erie obtain their water from that source. Large amounts of water for industrial use in the Buffalo area also come from Lake Erie.

Water for the rural areas of the county is obtained largely from drilled bedrock wells and a minor amount from dug wells. A small amount of water for these rural areas is supplied by springs. Springs occur naturally in confined areas where the water table reaches the surface. Because they are very scattered, springs are an unpredictable source of water for large-scale use.

Dug wells are relatively shallow and tend to dry up when the ground-water table is low. They are very effective in some valley bottoms where there is gravelly and sandy outwash, but they are subject to contamination.

Water is supplied to several of the larger communities from large-capacity wells or from impoundments. Large storage tanks with gravity flow are a partial source of reserve water in many of these systems.

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 units" and "Detailed soil map units."

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 units

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 Erie County are discussed on the following pages. The terms for texture in the introductory statement that describes each map unit, apply to the surface layer of the major soils in the unit. The terms for drainage class apply to only the major soils, and the range in slope covers only the dominant slopes of the soils in the map unit.

The Erie County general soil map joins with the general soil maps of adjacent Genesee and Wyoming Counties. In some areas, the names of the map units are not exactly the same because of differences in the proportion of major soils in the adjoining survey area. Also, the concepts and names of some soil series have changed over a period of time or they are grouped differently on the general soil map. In a few areas, the matching of adjoining units is not perfect because of a difference in scale of the general soil maps. In all cases however, areas in adjacent counties are joined by similar kinds of soil. The adjacent Cattaraugus and Chautauqua Counties do not have published general soil maps. Erie County is separated from Niagara County by Tonawanda Creek.

descriptions of the map units

areas dominated by deep soils formed in glacial till deposits

The three general soil map units in this group make up about 34 percent of the county. These soils formed mostly in deep glacial till deposits, and some soils are mantled with a thin layer of clayey or silty lake-laid sediments. The till deposits, derived from shale, siltstone, sandstone, or limestone, occur as nearly level to sloping ground moraines or as recessional moraines. In the southern part of the county, mostly in general soil map unit 3, the till deposits mantle broad hills and most of the acreage has been cleared. In the northern and central parts of the county, many areas are still used for farming but some have been converted to residental or other nonfarm uses. In the south-central and southern parts of the county, some areas are used for dairy farming, but wet and steep soils are reverting to brush and woodland.

1. Churchville-Ovid-Lima

Dominantly nearly level, deep, somewhat poorly drained and moderately well drained, medium textured soils; on lowland plains

The soils in this map unit formed in glacial till deposits. Some areas have a thin mantle of clayey sediments. The landscape is a relatively flat lowland plain with occasional low knolls. Slope is mostly less than 3 percent but ranges from 0 to 8 percent.

This map unit covers about 6 percent of the county. Churchville soils make up about 25 percent of the unit; Ovid soils, about 20 percent; and Lima soils, about 15 percent. Soils of minor extent make up the remaining 40 percent.

The Churchville soils formed in a thin deposit of gravel-free clayey sediment. This clayey deposit is underlain by loamy glacial till. The Churchville soils are deep and somewhat poorly drained. They are medium textured in the surface layer, dominantly fine textured in the subsoil, and medium textured in the substratum. The rate of water movement through the subsoil is slow or very slow. A perched seasonal high water table is in the upper part of the subsoil in the spring. These nearly level to gently sloping soils are on broad areas of the lowland plain.

The Ovid soils formed in glacial till mixed with some clayey sediments. They are deep and somewhat poorly drained. These soils are medium textured in the surface layer, moderately fine textured in the subsoil, and medium textured or moderately fine textured in the substratum. The rate of water movement through the subsoil is moderately slow. A perched water table is in the upper part of the subsoil in winter and spring. These nearly level to gently sloping soils are on broad areas of the lowland plain.

The Lima soils formed in loamy glacial till. They are deep, moderately well drained, and dominantly medium textured throughout. The rate of water movement through the subsoil is moderate. The lower part of the subsoil is saturated for short but significant periods in the spring. These nearly level and gently sloping soils are on slight rises or low knolls.

Soils of minor extent are in the Honeoye, Cazenovia, Cayuga, Appleton, and Lyons series. The well drained Honeoye soils are on the highest part of knolls and ridges. The moderately well drained Cazenovia and Cayuga soils are in areas where clayey sediments were mixed with loamy till or where clayey sediments mantle loamy glacial till. The somewhat poorly drained, loamy Appleton soils are in low, flat areas. The poorly drained and very poorly drained Lyons soils are in depressions that remain wet for prolonged periods.

Most areas of this map unit have been cleared and are used for farming. The better drained Lima soils in this map unit and the Churchville and Ovid soils that have been drained are used for corn and grain crops. Some areas of this map unit are now idle and are undergoing changes to residential or other nonfarm uses. Seasonal wetness and slow water movement through the subsoil or substratum are the main limitations affecting most uses of these soils.

2. Darien-Remsen-Angola

Dominantly nearly level and gently sloping, deep and moderately deep, somewhat poorly drained, medium textured and moderately fine textured soils; on uplands underlain by alkaline shale bedrock

The soils in this map unit formed in shaly glacial till at the northernmost fringe of the upland plateau. The landscape is undulating. Slope is mostly 0 to 8 percent but ranges from 0 to 15 percent. Most slopes have a gentle northwest aspect.

This map unit covers about 11 percent of the county. Darien soils make up about 25 percent of the unit; Remsen soils, about 15 percent; and Angola soils, about 10 percent. Soils of minor extent make up the remaining 50 percent.

The Darien soils are deep and have a medium textured surface layer and a moderately fine textured subsoil. The rate of water movement through the subsoil is moderately slow. A perched water table is in the upper part of the subsoil in winter and spring. These soils are nearly level to sloping.

The Remsen soils are deep and have a medium textured or moderately fine textured surface layer and a fine textured subsoil. The rate of water movement through the subsoil is very slow. A perched water table is in the upper part of the subsoil in winter and spring. These Remsen soils are commonly underlain by soft shale bedrock at a depth of 5 to 10 feet. These soils are nearly level to sloping.

The Angola soils are moderately deep and have a medium textured surface layer and a moderately fine textured subsoil. The rate of water movement through the subsoil is slow. A perched water table is in the subsoil in winter and spring. Black, brittle shale bedrock is at a depth of 20 to 40 inches. These soils are nearly level or gently sloping.

Soils of minor extent include those of the Aurora, Hornell, Canadice, Ilion, Derb, and Orpark series. The moderately well drained Aurora soils are on knolls or slope breaks, usually within areas of Angola soils. The Derb, Hornell, and Orpark soils are similar to the major soils in the map unit, except that they are more acid. The poorly drained Canadice and Ilion soils are in low areas or depressions that remain wet for prolonged periods.

Most areas of this map unit were originally cleared of forest cover and used for farming. Some areas are still farmed, mostly dairy operations; however, many fields are now idle. Areas of Remsen soils are especially difficult to till because of the sticky and cloddy nature of the soil. Eroded or scraped spots are very difficult to revegetate.

Parts of this map unit are in the suburban area surrounding the city of Buffalo. Seasonal wetness, slow water movement through the subsoil or substratum, and the clayey nature of many of the soils are the main limitations affecting most uses of these soils.

3. Volusia-Mardin-Erie

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

The soils in this map unit formed in loamy glacial till derived mostly from siltstone, sandstone, and shale. The Erie soils usually contain a small amount of limestone. The landscape is dominantly broad, smooth hilltops and hillsides on the upland plateau. Slope is mainly 3 to 15 percent but ranges from 0 to 25 percent.

This map unit covers about 17 percent of the county. Volusia soils make up 25 percent of the unit; Mardin soils, about 25 percent; and Erie soils, about 10 percent. Soils of minor extent make up the remaining 40 percent.

The Volusia soils are deep, somewhat poorly drained, and dominantly medium textured. A dense fragipan layer begins about 15 inches below the surface. The rate of water movement through the surface layer and upper part of the subsoil is moderate, and it is slow or very slow in the fragipan. A perched seasonal high water table is above the fragipan in the winter and spring. These nearly level and gently sloping soils are on foot slopes, along drainageways, or in saddles that commonly receive runoff from the higher adjacent Mardin soils.

The Mardin soils are deep, moderately well drained, and medium textured. A dense fragipan layer begins about a foot and a half below the surface. The rate of water movement through the surface layer and upper part of the subsoil is moderate, and it is slow or very slow in the fragipan. A temporary perched seasonal water table is above the fragipan early in the spring or during other unseasonally wet periods. These gently sloping to moderately steep Mardin soils are on convex hilltops and side slopes that receive little or no runoff from adjacent areas.

The Erie soils are deep, somewhat poorly drained, and dominantly medium textured. A dense fragipan layer begins about 14 inches below the surface. The rate of water movement through the surface layer and upper part of the subsoil is moderate, and it is slow or very slow in the fragipan. A perched seasonal high water table is above the fragipan in the spring or during other excessively wet periods. These nearly level to sloping Erie soils are on foot slopes or along drainageways where some runoff is commonly received from the adjacent higher soils, or they are in flat areas where surface water removal is rather slow.

Soils of minor extent include those of the Langford, Schuyler, Marilla, Valois, Lyons, Manlius, Orpark, and Wayland series. The moderately well drained Langford and Marilla soils are similar to the Mardin soils, except that the Langford soils have slightly more clay in the fragipan and the Marilla soils have a higher shale content. The Schuyler soils are moderately well drained and do not have a fragipan. The well drained Valois soils are in morainic areas where the till is mixed with outwash. The well drained Manlius soils and the somewhat poorly drained Orpark soils are in places where bedrock is about 40 inches below the soil surface. The poorly drained Lyons soils are in depressions. The poorly drained and very poorly drained Wayland soils are along the narrow drainageways that drain some of the map unit.

Most of the landscape, where slopes are favorable, was cleared of forest cover; but scattered wetter areas and steep side slopes remain mainly wooded or are idle and covered with brush. The cleared areas are used mainly for dairy farming (fig. 2). Erosion control and supplemental drainage of the wetter areas are the main problems in the cultivation of these soils. The seasonally high water table and the slow or very slow movement of water through the dense fragipan layer strongly influence most uses of these soils.

areas dominated by moderately deep and shallow soils formed in glacial till

The two general soil map units in this group make up about 12 percent of the county. These soils mainly formed in glacial till deposits less than 40 inches deep to limestone or shale bedrock. In some places the bedrock is exposed. The soils in these map units are mostly nearly level to sloping, but some areas along valley sides and on escarpment faces are steep or very steep. Some areas are used for general farming, orchards, or vineyards, while other areas, particularly where the soils are shallow or steep, are idle and are reverting to brush and trees. A few small areas support industrial buildings.

4. Orpark-Manlius-Derb

Dominantly nearly level through very steep, moderately deep and deep, somewhat poorly drained to excessively drained, moderately fine textured or medium textured soils; on uplands underlain by acid shale bedrock

The soils in this map unit formed in acid shaly glacial till. The landscape is one of crests and side slopes near the northern edge of the upland plateau. Slope is mainly 3 to 15 percent on crests and steeper on side slopes. It ranges from 0 to 50 percent.

This map unit covers about 10 percent of the county. Orpark soils make up about 35 percent of the unit; Manlius soils, about 20 percent; and Derb soils, about 20 percent. Soils of minor extent make up the remaining 25 percent.

The Orpark soils are moderately deep and somewhat poorly drained. They are dominantly moderately fine textured in the surface layer and subsoil and are underlain by acid shale bedrock at a depth of 20 to 40 inches. The rate of water movement through the subsoil is slow or moderately slow. A perched water table is in the upper part of the subsoil from late in fall through spring. These soils are nearly level through sloping and are on plateau crests. Most nearly level areas are on benchlike landforms.

The Manlius soils are moderately deep and well drained to excessively drained. They have a medium textured surface layer and subsoil and are underlain by acid shale bedrock at a depth of 20 to 40 inches. The rate of water movement through the subsoil is moderate. Free water is in the soil for very short periods following rains. The gently sloping Manlius soils are near plateau crests. The sloping to very steep Manlius soils are on side slopes.

The Derb soils are deep and somewhat poorly drained. They have a medium textured surface layer and a medium textured or moderately fine textured subsoil. The rate of water movement through the subsoil is moderately slow or moderate. A perched water table is in the upper part of the subsoil from late in fall through spring. Bedrock is usually at a depth of 40 to 60 inches.

Soils of minor extent include those of the Hornell, Schuyler, Marilla, Farnham, and Patchin series. The Hornell soils are somewhat poorly drained and contain more clay than the major soils. The Schuyler soils are similar to the Derb soils but are better drained and are along plateau sides. The moderately well drained Marilla soils have a fragipan. The moderately well drained Farnham soils are in stratified outwash deposits of small

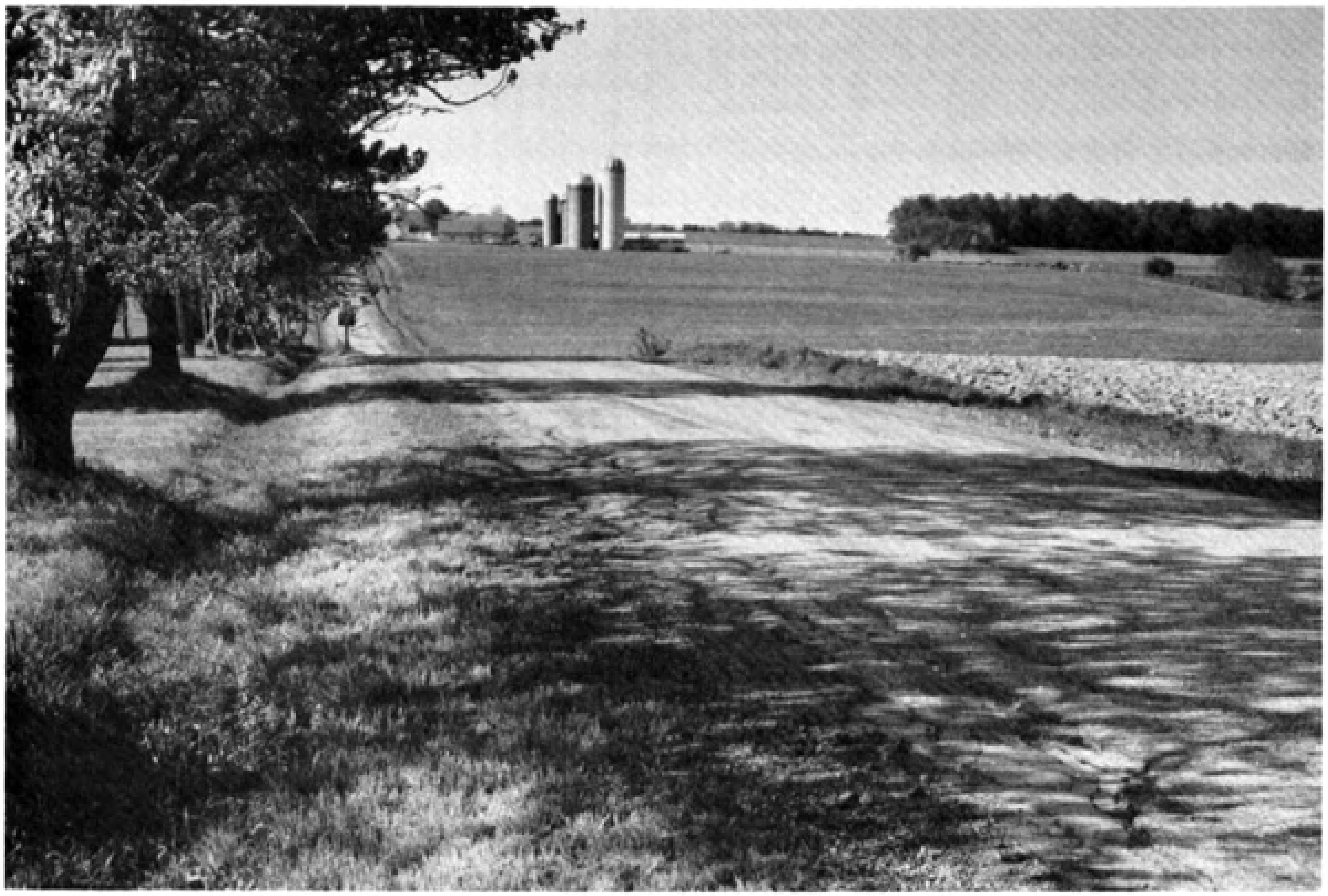


Figure 2.—Some upland areas of a dairy farm in the Volusia-Mardin-Erie general soil map unit are used for forage crops and field crops.

deltas or on beach ridges near foot slopes. The poorly drained Patchin soils are in wet upland depressions.

Most of the less sloping areas of this map unit were originally cleared of forest cover, but the steeper areas remain in woodland. Some areas that were cleared are still used in general farming or for orchards and vineyards (fig. 3); however, many areas are now idle. Gullies or stream entrenchments are common along steep side slopes. Some of these gullies are dangerous or impossible to cross with equipment. Seasonal wetness, shale bedrock at a moderate depth, and the steep slopes in many places are the main limitations to the use of these soils for community development.

5. Wassaic-Benson-Farmington

Dominantly nearly level, moderately deep and shallow, moderately well drained to excessively drained, medium textured soils; on uplands underlain by limestone bedrock

The soils in this map unit formed in glacial till derived mainly from limestone. These soils form a band running east-west through the northern part of the county. A prominant geologic feature is the Onondaga limestone escarpment, which faces north and generally is steep. There are limestone outcrops in some places. Slope is mainly 0 to 3 percent but ranges from 0 to 40 percent.

This map unit covers about 2 percent of the county. Wassaic soils make up about 35 percent of the unit; Benson soils, about 20 percent; and Farmington soils, about 9 percent. Soils of minor extent make up the remaining 36 percent.

The Wassaic soils formed in glacial till high in limestone content. They are moderately deep, moderately well drained and well drained, and dominantly medium textured. The rate of water movement is moderate or moderately slow through the subsoil. A temporary seasonal water table is above the bedrock in some places early in spring. Bedrock is at a depth of 20 to 40 inches. Most areas of these soils are nearly level or gently sloping and are on the smooth slopes near the south edge of the limestone escarpment. Some areas of steep Wassaic soils are intermingled with Rock outcrop on the face of the escarpment.

The Benson soils are shallow, excessively drained or somewhat excessively drained, and medium textured. They have a high content of limestone fragments. The rate of water movement is moderate through the thin soil mantle. Because most of the underlying bedrock is at a depth of 10 to 20 inches and is fractured, there is seldom any free water in the soil. These nearly level to sloping soils are along the top edge of the limestone escarpment.

The Farmington soils are shallow, well drained, and dominantly medium textured. These soils contain fewer cherty fragments than the Benson soils. The rate of water movement is moderate through the soil. Because the underlying bedrock is at a depth of 10 to 20 inches and is fractured, there is seldom any free water in the soil. These nearly level and gently sloping soils are near the upper edge of the limestone escarpment.

Soils of minor extent are in the Newstead, Lamson, Lima, and Honeoye series. Some areas are mainly Rock outcrop or rock-quarries. The somewhat poorly drained Newstead soils are in low, flat areas where the underlying bedrock is not sufficiently fractured to allow water to move readily through it. The poorly drained Lamson soils are in low pockets filled with sandy material. In areas of the moderately well drained Lima soils and the well drained Honeoye soils the underlying bedrock is more than 40 inches below the surface.

There is some general farming in areas made up largely of the Wassaic soils or the deep minor soils. Areas of Benson soils or Rock outcrop are not suited to cultivation. These areas mostly are idle or remain wooded. Bedrock near the surface is a serious limitation for most uses. Although some areas support idustrial buildings (fig. 4), the limestone rock generally requires blasting.

areas dominated by deep soils formed in glacial lake sediments

The three general soil map units in this group make up about 29 percent of the county. These soils formed in clayey, silty, and sandy lake-laid deposits that are usually free of rock fragments. In some places, particularly along lower valley sides, gravelly outwash deposits mantle the lake-laid sediments or glacial till is intermingled with the lake sediments. The map units in this group are mostly on the lowland lake plain in the northern part of the county and in major valleys that dissect the upland plateau in the central and southern parts. Most areas are nearly level or gently sloping, but in some dissected areas slope ranges to moderately steep or steep. Some areas that were originally cleared are still used for farming; however, many areas, particularly where the soils are wet or steep, have reverted to brush and trees. Some places near the suburbs of Buffalo are used for residential development.

Figure 3.—Typical land-use pattern in the Orpark-Manlius-Derb general soil map unit. The vineyard in the foreground is on the Manlius soils.

Figure 4.—Level-bedded limestone bedrock underlying the Wassaic-Benson-Farmington general soil map unit is a serious limitation for most uses, but it provides excellent support for industrial buildings.

6. Hudson-Varysburg-Valois

Dominantly gently sloping through moderately steep, deep, moderately well drained and well drained, medium textured and moderately fine textured soils; in valleys

This map unit is dominated by the Hudson soils that formed in glacial lake deposits high in content of silt and clay. The Varysburg soils have a mantle of glacial outwash, and the Valois soils formed in glacial till mixed with glacial outwash deposits. The landscape is a well dissected lacustrine plain along valley floors and the adjacent lower valley walls. Slope is mostly 3 to 25 percent but ranges from 0 to 40 percent.

This map unit covers about 8 percent of the county. Hudson soils make up about 20 percent of the unit; Varysburg soils, about 15 percent; and Valois soils about 10 percent. Soils of minor extent make up the remaining 55 percent.

The Hudson soils formed in lake-laid sediments high in silt and clay content. These soils are deep and moderately well drained. The surface layer is medium textured or moderately fine textured, and the subsoil is dominantly fine textured. There are very few or no gravel fragments. The rate of water movement is moderate or moderately slow through the surface layer and slow or very slow through the subsoil. The upper part of the subsoil has a high water table from late fall through early spring. Surface water is readily removed from the soil. These soils are mostly moderately steep or steep and are on sides of terraces and dissecting gullies. In some areas the soils are gently sloping or rolling.

The Varysburg soils formed in a thin layer of gravelly glacial outwash that mantles clayey, glacial lake sediments. These soils are deep and moderately well drained or well drained. The surface layer and upper part of the subsoil are dominantly medium textured, and the lower part of the subsoil and the substratum are mainly fine textured. The rate of water movement is moderately rapid or moderate in the gravelly mantle and very slow in the underlying clay deposits. A thin zone of water is perched above the clay material in the spring. Nearly level and gently sloping soils are on the tops of terraces, and sloping to steep soils are on terrace sides or lower valley walls.

The Valois soils formed in glacial till deposits derived from sandstone, siltstone, and shale. These deposits are intermingled with or are underlain by glacial outwash deposits. The Valois soils are deep and well drained. The surface layer is medium textured; the subsoil and substratum are medium textured or moderately coarse textured. The rate of water movement through the subsoil is moderate, and it is moderate or moderately rapid in the substratum. The water table is at a depth of 6 feet or more. These gently sloping to moderately steep soils are on low, rounded knolls in drainage divides or in hilly areas along valley sides.

Soils of minor extent include the Collamer, Arkport, Rhinebeck, Niagara, Canandaigua, Mardin, Darien, and Chenango series. The moderately well drained Collamer soils and the somewhat poorly drained Niagara soils are in areas of silty deposits. The well drained Arkport soils are in sandy areas. The somewhat poorly drained Rhinebeck soils are in clayey deposits. The very poorly drained and poorly drained Canandaigua soils are commonly in low, wet pockets. The moderately well drained Mardin soils and the somewhat poorly drained Darien soils are in areas of deep glacial till. The Chenango soils are on some outwash terraces. The Fluvaquents and Udifluvents are adjacent to small streams and are subject to frequent flooding.

This map unit has a variable pattern of plant cover and use. Areas of the dominant soils that have favorable slopes have been mostly cleared of forest cover and are used for farming. The steeper soils are mostly wooded or, if cleared, are now in brushy cover or pasture. Some of these steeper soils have a very high tendency to slump or slip downslope. This is especially true after prolonged wet periods or when the ground thaws early in the spring. This tendency to slump and the clayey nature of some of the soils are major considerations for many uses. The Valois soils generally have fewer limitations than the Hudson and Varysburg soils.

7. Niagara-Canandaigua-Cosad

Dominantly nearly level, deep, somewhat poorly drained to very poorly drained, medium textured soils; on lowland plains

The soils in this map unit formed in glacial lake-laid deposits. The landscape is a broad, nearly flat plain that is traversed by an occasional stream or drainageway. Usually areas farthest from the streams are depressed wetlands. Slope is mainly 0 to 3 percent but ranges from 0 to 8 percent.

This map unit covers about 13 percent of the county. Niagara soils make up about 25 percent of the unit; Canandaigua soils, about 10 percent; and Cosad soils, about 10 percent. Soils of minor extent make up the remaining 55 percent.

The Niagara soils formed in lake-laid deposits that are dominantly silt. These soils are deep and somewhat poorly drained. They are dominantly medium textured or moderately fine textured. The rate of water movement through the soil is moderately slow. The water table is within 1-1/2 feet of the surface in the winter and spring. The Niagara soils are on extensive flats in low, undulating areas. They contain very few or no gravel fragments.

The Canandaigua soils formed in lake-laid deposits that are dominantly silt. These soils are deep and poorly drained or very poorly drained. The very poorly drained part has a surface layer enriched with humus. These soils are dominantly medium textured. The rate of water movement through the soil is mostly moderately slow. These nearly level soils are often in depressions. In the spring, the water table is at or near the surface for prolonged periods and some areas are ponded.

The Cosad soils formed where a thin layer of sandy material mantles lake-laid clayey sediments. These soils are deep and somewhat poorly drained. They are coarse textured and moderately coarse textured in the surface layer and subsoil and fine textured in the substratum. The rate of water movement is rapid in the sandy mantle and slow or very slow in the substratum. During the late fall through spring, a perched water table is above the clayey sediments. These soils are in relatively flat areas that are usually adjacent to areas of lake-laid clay sediments, such as those associated with the Odessa soils.

Soils of minor extent include the Getzville, Swormville, Raynham, Collamer, Elnora, Minoa, Lamson, Phelps, Palms, Odessa, and Teel series. The somewhat poorly drained Swormville soils and poorly drained Getzville soils are similar to the Niagara and Canandaigua soils except that the Swormville and Getzville soils are sandy in the lower subsoil and the substratum. The somewhat poorly drained Raynham soils do not have the clay content of the Niagara soils. The Collamer soils are moderately well drained and formed in gravel-free silty deposits. The moderately well drained Elnora soils, the somewhat poorly drained Minoa soils, and the poorly drained Lamson soils all formed in sandy sediments. The moderately well drained Phelps soils formed in isolated deposits of glacial outwash. The very poorly drained Palms soils formed in organic material in deep depressions. The Odessa soils are in areas of dominantly clayey deposits. The Teel and similar soils are on flood plains adjacent to major streams that traverse this unit. The Teel soils are of alluvial origin.

Most of this map unit was cleared of forest cover and used originally for farming. The areas remaining wooded or idle with brushy cover are mainly the more poorly drained soils. Many areas are still farmed. These soils are easy to cultivate and, when properly drained, respond well to good management. For most uses, seasonal or prolonged wetness is the primary consideration. Substratum excavations and cuts are subject to slumping, sloughing, or piping. The soil along ditchbanks and in other excavations is highly erodible. Some areas of this map unit on the Tonawanda Plain are susceptible to flooding.

8. Odessa-Schoharie-Rhinebeck

Dominantly nearly level and gently sloping, deep, somewhat poorly drained to well drained, medium textured and moderately fine textured soils; on lowland plains

The soils in this map unit formed in clayey glacial lake-laid deposits. The landscape is a nearly flat plain dissected in some places by stream channels. Slope is mainly 0 to 8 percent but ranges from 0 to 15 percent.

This map unit covers about 8 percent of the county. Odessa soils make up about 45 percent of the unit; Schoharie soils, about 10 percent; and Rhinebeck soils, about 10 percent. Soils of minor extent make up the remaining 35 percent.

The Odessa soils formed in lake-laid deposits of clay and silt. They are usually varved or stratified in the substratum. These soils are deep and somewhat poorly drained. They are dominantly medium textured in the surface layer and fine textured in the subsoil and substratum. The rate of water movement through the subsoil and substratum is slow or very slow. During the winter and spring, a perched water table is in the upper part of the subsoil. There are few or no gravel fragments. Usually, these soils are in extensive flat areas.

The Schoharie soils are similar to the Odessa soils. They formed in the same kind of sediment but are usually adjacent to areas dissected by streams. This allows for quicker removal of surface water and results in the soil being well drained and moderately well drained. These Schoharie soils are gently sloping or sloping where they border dissections and drainageways, and they flatten out to nearly level in adjacent areas.

The Rhinebeck soils are similar to the Odessa soils. They also are somewhat poorly drained but formed in sediments that are gray rather than red. Most Rhinebeck soils are near the southern border of the map unit. They are nearly level or gently sloping.

Soils of minor extent include the Claverack, Cosad, Cayuga, Churchville, Niagara, Lakemont, and Wayland series. The moderately well drained Claverack and somewhat poorly drained Cosad soils are in areas where a mantle of sandy material covers the clayey deposits. The moderately well drained and well drained Cayuga soils and the somewhat poorly drained Churchville soils are in areas where the clayey deposits are a thin mantle underlain by loamy glacial till. The somewhat poorly drained Niagara soils formed in silty sediments, and the poorly drained and very poorly drained Lakemont soils are in depressions adjacent to the Odessa soils. The Wayland or similar soils are on flood plains adjacent to major streams that traverse this map unit.

Most areas of this map unit were originally cleared of forest cover and used for farming. A few areas are still farmed, but many fields are now idle or in brushy cover (fig. 5). These soils are very sticky when wet and cloddy when dry. Some areas of this map unit are on the edge of the suburbs of Buffalo. Seasonal wetness, slow or very slow permeability in the subsoil, and clayey textures are the main limitations of these soils for most uses. Parts of this map unit are susceptible to flooding.

areas dominated by deep soils formed in glacial outwash deposits

The two general soil map units in this group make up about 15 percent of the county. The soils in these units formed mainly in gravelly or shaly glacial outwash deposits. In some places, the outwash deposits mantle clayey or silty lake-laid sediments. These soils generally have good drainage, ranging from moderately well drained to somewhat excessively drained. They are primarily on beach ridges, outwash fans, and outwash plains across the central part of the county and on valley terraces and plains in the southern part. Slope is mostly nearly level to rolling, except along terrace fronts and in dissected and hilly areas, where it ranges to moderately steep or steep. Many areas of this map unit are used for vegetable and speciality crops as well as for crops that are needed for dairy farms. Some areas are well suited to irrigated crops. A few areas support residential developments.

Figure 5.—Typical land-use pattern in the Odessa-Schoharie-Rhinebeck general soil map unit. The Odessa soils in the foreground are often idle, and the Schoharie soils in the background are commonly used for homesites. Lakemont soils are along drainageways.

9. Chenango-Castile-Varysburg

Dominantly nearly level through moderately steep, deep, somewhat excessively drained to moderately well drained, medium textured soils; on plains and in valleys

The soils in this map unit formed in glacial outwash and lacustrine sediments. The landscape consists of nearly level to rolling plains or stream terraces that have moderately steep fronts. The terrace tops are flat to undulating with scattered low, wet pockets. Slope is mostly 0 to 25 percent but ranges to 40 percent.

This map unit covers about 5 percent of the county. Chenango soils make up about 45 percent of the unit; Castile soils, about 10 percent; and Varysburg soils, about 10 percent. Soils of minor extent make up the remaining 35 percent.

The Chenango and Castile soils formed in glacial outwash deposits that are dominantly sandstone and siltstone fragments. Both soils are medium textured in the surface layer, moderately coarse textured or medium textured in the subsoil, and coarse textured in the substratum. Both soils are deep and contain an abundance of rounded gravel.

The Chenango soils are somewhat excessively drained or well drained. The rate of water movement through the subsoil is moderate or moderately rapid, and it is rapid in the substratum. These soils are nearly level, gently sloping, or rolling on the terrace tops or plains and are moderately steep or steep on the sides of terraces. The water table is usually at a depth of more than 6 feet.

The Castile soils are moderately well drained. The rate of water movement through the subsoil is moderately rapid, and it is rapid or very rapid in the substratum. From March through May, a temporary water table is within 2 feet of the surface. These soils are nearly level or gently sloping and are on broad terraces. They usually are at a slightly lower level than the adjacent better drained Chenango soils.

The Varysburg soils formed in a thin layer of gravelly glacial outwash that mantles clayey, glacial lake sediments. These soils are deep and moderately well drained or well drained. The surface layer and upper part of the subsoil is dominantly medium textured, and the lower part of the subsoil and the substratum is mainly fine textured. The rate of water movement is moderately rapid or moderate in the gravelly mantle and very slow in the underlying clay deposits. A thin zone of water is perched above the clay material in the spring. Nearly level and gently sloping soils are on the terrace tops, and sloping to steep soils are on terrace sides or lower valley walls.

Soils of minor extent include the Valois, Scio, Rhinebeck, Hudson, Halsey, and Middlebury series. The well drained Valois soils are along lower valley sides where the glacial outwash is mixed with glacial till. The moderately well drained Scio soils are in silty pockets. The somewhat poorly drained Rhinebeck and moderately well drained Hudson soils are in areas dominated by clayey deposits. The poorly drained and very poorly drained Halsey soils are in depressions that remain wet much of the time. The moderately well drained Middlebury soil and other alluvial soils are on flood plains along streams.

Most of this map unit that has favorable slopes was cleared of forest cover and provides excellent sites for farming. Most of the major soils dry out readily early in the spring and are easy to cultivate. Specialty crops, such as dry and snap beans, potatoes, and strawberries, are grown along with crops for dairy farms. Gravel fragments can be bothersome in planting and cultivating some crops. The steeper areas of this map unit are dominantly the Hudson and Varysburg soils and are subject to slippage or slumping. Some of the larger villages in the southern end of Erie County are in this map unit. Generally the better drained outwash soils provide good sites for most uses and are suitable sources of sand and gravel.

10. Blasdell-Farnham-Alton

Dominantly nearly level through sloping, deep, moderately well drained to somewhat excessively drained, medium textured soils; in valleys and on plains

The soils in this map unit formed in shaly or gravelly glacial outwash deposits. The landscape consists of stream terraces, beach ridges, outwash fans, and benches or pockets of lacustrine sediments mantled with outwash deposits. These landforms front the uplands and extend up many of the valleys. Slope is mainly 0 to 15 percent but ranges to 25 percent.

This map unit covers about 10 percent of the county. The Blasdell soils make up about 20 percent of the unit; Farnham soils, about 15 percent; and Alton soils, about 10 percent. Soils of minor extent make up the remaining 55 percent.

The Blasdell soils formed in acid shaly glacial outwash deposits. These soils are deep and well drained. They are dominantly medium textured and have a high content of shale fragments. The rate of water movement through the soil is moderately rapid. Depth to the perched seasonal high water table is usually more than 6 feet. These gently sloping or sloping soils are on valley terraces and beach ridges.

The Farnham soils are similar to the Blasdell soils but are moderately well drained. These Farnham soils are dominantly medium textured and have a large content of shale fragments. The rate of water movement through the soil is moderately rapid. The water table rises to within a foot or two of the surface during the winter and spring. Parts of outwash fan landforms are susceptible to occasional flooding. These nearly level or gently sloping soils are on terraces and fans in the valleys and on the beach ridges on the lowland plain.

The Alton soils formed in gravelly and sandy glacial outwash deposits. These soils are deep and well drained to somewhat excessively drained. They have a medium textured or moderately coarse textured surface layer and subsoil and a coarse textured substratum. In some places, the lower part of the substratum is silty. The rate of water movement is moderately rapid through the subsoil and rapid or very rapid in the substratum. Depth to the perched seasonal high water table is usually more than 6 feet. These nearly level to sloping soils are on beach ridges, terraces, and sand bars mainly facing northeast-southwest.

Soils of minor extent are in the Arkport, Galen, Palmyra, Phelps, Red Hook, Collamer, Minoa, Niagara, Rhinebeck, Canandaigua, and Teel series. The well drained Arkport soils and moderately well drained Galen soils formed in sandy deposits. The well drained Palmyra soils, moderately well drained Phelps soils, and somewhat poorly drained Red Hook soils formed in the outwash deposits that are dominantly limestone rather than sandstone and shale. The moderately well drained Collamer soils formed in silty deposits, and the somewhat poorly drained Minoa soils formed in sandy deposits. The somewhat poorly drained Niagara and Rhinebeck soils formed in deposits high in silt and clay. The poorly drained and very poorly drained Canandaigua soils are in low pockets or depressions that remain wet much of the time. The Teel and similar soils are on flood plains adjacent to major streams that traverse this map unit.

Most areas of this map unit were cleared of forest cover. There are many excellent farms on these soils. Some areas are good homesites. Seasonal wetness of the Farnham soils, occasional flooding, and gravel or shale fragments are the main limitations affecting most uses of these soils. Some areas that have a silty or clayey substratum are prone to slippage or slumping when excavated, particularly when the soil is wet. Some areas are a suitable source of sand and gravel.

areas dominated by soils in urban areas

Only one general soil map unit is in this group, and it makes up 10 percent of the county. It consists of areas that are highly developed for commercial, industrial, or residential uses intermingled with small open areas of undisturbed soils. The urban land part consists of sites of houses, buildings, parking lots, streets, sidewalks, and other areas covered by asphalt or concrete. The open areas of relatively undisturbed soils consist mostly of small lawns, gardens, courtyards of apartments, undeveloped lots, small local parks, and traffic islands. The soils in these areas formed mostly in glacial till, lake-laid sediments, or alluvium. They occur mainly in and around the city of Buffalo. Most areas are nearly level, but a few areas are gently sloping or sloping. Further commercial or industrial development is limited by the small size of the remaining open areas.

11. Urban land

Dominantly nearly level urbanized areas and areas of well drained to poorly drained soils and disturbed soils; on lowland plains

This map unit is composed of areas that are highly developed for commercial, industrial, or residential uses. Most of the areas are in and around the city of Buffalo. They are on a low plain that gently tilts toward Lake Erie or the Niagara River shoreline. A limestone escarpment causes a slight rise in the landscape in the northeast part of this unit. Slope is mainly 0 to 3 percent but ranges up to 15 percent.

This map unit covers about 10 percent of the county. Urban land makes up 50 percent of the unit, and soils of minor extent make up the remaining 50 percent.

In the Urban land part of this map unit very little of the original undisturbed soil remains. Most areas are heavily developed residential blocks, roads, parking lots, shopping centers, business districts, and industrial complexes. The residential uses include foundations, driveways, sidewalks, streets, paved tennis courts, and playgrounds. In some areas where the soil surface is exposed, such as small lawns and gardens, traffic islands, and courtyards, the soil surface has been disturbed by cutting, filling, or grading.

Soils of minor extent include the Lima, Niagara, Odessa, Schoharie, Teel, Wassaic, Cayuga, and Churchville series. The moderately well drained Lima soils formed in deep glacial till deposits, and the well drained and moderately well drained Wassaic soils formed in a thin till mantle over bedrock. The somewhat poorly drained Niagara soils formed in silty lacustrine sediments. The moderately well drained and well drained Schoharie soils and the somewhat poorly drained Odessa soils formed in clayey deposits. The Teel soils are on flood plains along the major streams. The well drained and moderately well drained Cayuga soils and the somewhat poorly drained Churchville soils are on till plains mantled with clayey lake-laid sediments.

The margins of this map unit are slowly expanding into adjacent undisturbed soil areas. This is primarily a land use change from rural to residential areas and an occasional shopping complex or industrial park.

The open areas of undisturbed soils within this map unit are not well suited to further development because of their small size. Most new development is taking place where old buildings have been demolished. A few of the larger open areas are suitable for local parks or recreational areas depending on the limitations of the particular soil.

detailed soil map units

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Blasdell shaly silt loam, 3 to 8 percent slopes, is one of several phases in the Blasdell 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. Odessa-Lakemont silt loams 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. Chenango and Palmyra soils, 25 to 40 percent slopes, 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

AlA—Allard silt loam, 0 to 3 percent slopes. This nearly level soil is deep and well drained. It is on stream terraces of silt-mantled glacial outwash. Areas of this soil are roughly rectangular or oblong and range from 5 to 20 acres.

Typically, this soil has a surface layer of dark brown silt loam about 9 inches thick. The subsoil extends to a depth of about 27 inches. It is strong brown silt loam in the upper part and yellowish brown light silt loam in the lower part. The substratum to a depth of 60 inches is brown and light brownish gray very gravelly loamy sand.

Included with this soil in mapping are small intermingled areas of moderately well drained Scio soils in slight depressions where a thick silt mantle is underlain by gravel deposits. Also included is a soil that has a silt mantle less than 18 inches thick. Areas of the included soils are 1/4 acre to 3 acres.

The permeability of this Allard soil is moderate in the subsoil and rapid or very rapid in the substratum. The available water capacity is high, and runoff is slow. There is generally no gravel in the surface layer and subsoil.

Depth to bedrock is 5 feet or more. The surface layer and subsoil are very strongly acid to medium acid.

This soil is well suited to farming, and most of the acreage is farmed. It has few limitations for most urban uses.

This Allard soil is well suited to most cultivated crops. Potatoes do exceptionally well. Corn, potatoes, and beans are the main crops. Crops respond well to liberal application of lime and fertilizer. The use of mechanical harvesters is not restricted by gravel or cobblestones. This soil dries out quickly early in the spring and after heavy rains. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and rotating crops help maintain the organic matter content and good tilth. Irrigation systems are easy to manage on this nearly level soil.

This soil is suited to pasture and hay. Proper stocking, rotational grazing, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs for maintaining high quality pasture.

The potential of this soil for wood crops is good, but only a small acreage is wooded. There are few limitations for the use of equipment, and there is little hazard of erosion or of trees uprooting during windstorms. Seedling mortality is usually low because of the high available water capacity of the soil.

This Allard soil is well suited to most urban and recreational uses. Septic tank absorption fields function well, but care must be taken to avoid possible contamination of the water table because the substratum is rapidly permeable. Frequent fertilization, liming, and irrigation help maintain grass and shrubs. This soil is a good source of topsoil, and when the silty overburden is removed, it is a good source of sand and gravel. Some areas provide excellent sites for athletic fields or for other uses that require a nearly level, stone-free site.

This Allard soil is in capability class I.

AlB—Allard silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on stream terraces of silt-mantled glacial outwash. Areas of this soil are roughly rectangular or oblong and range from 5 to 20 acres.

Typically, this soil has a surface layer of dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 27 inches. It is strong brown silt loam in the upper part and yellowish brown light silt loam in the lower part. The substratum to a depth of 60 inches is brown and light grayish brown very gravelly loamy sand.

Included with this soil in mapping are small intermingled areas of moderately well drained Scio soils in slight depressions where a thick silt mantle is underlain by gravel deposits. Also included is a soil that has a silt mantle less than 18 inches thick. Areas of the included soils are 1/4 acre to 3 acres.

The permeability of this Allard soil is moderate in the subsoil and rapid or very rapid in the substratum. The available water capacity is high, and runoff is medium. There is generally no gravel in the surface layer and subsoil. Depth to bedrock is 5 feet or more. The surface layer and subsoil are very strongly acid to medium acid.

This soil is well suited to farming, and most of the acreage is farmed. It has few limitations for most urban uses.

This Allard soil is suited to most cultivated crops. Corn, potatoes, and beans are the main crops. Because the soil is acid and low in natural fertility, crops respond well to liberal application of both lime and fertilizer. The use of mechanical harvesters is not restricted by gravel or cobblestones. This soil dries out quickly in the spring and after heavy rains. Erosion is a hazard, particularly where slopes are long. Keeping tillage to a minimum, tilling across slope, using cover crops, incorporating crop residues into the soil, and including sod crops in the cropping system help reduce the erosion hazard, maintain the organic matter content, and preserve tilth. This soil is suited to irrigation, but irrigation systems are more difficult to manage than on the nearly level Allard soils.

This soil is suited to pasture and hay. Proper stocking, rotational grazing, yearly mowing, and deferment of grazing when the soil is wet help prevent seedling loss and promote good forage growth. Fertilizer and lime should be applied for best pasture growth.

The potential of this soil for wood crops is good, but only a small acreage is wooded. There are few limitations for the use of equipment, and the uprooting of trees during windstorms is usually not a hazard. Erosion along logging trails can be a problem on long slopes. Seedling mortality is normally low because of the high available water capacity of the soil.

This Allard soil is suitable for many urban and recreational uses. It is suitable for septic tank absorption fields, but care must be taken to avoid possible contamination of the underlying water table because the substratum is rapidly permeable. Frequent fertilization, liming, and irrigation help maintain grass and shrubs. This soil is a good source of topsoil, and the substratum is a suitable source of sand and gravel.

This Allard soil is in capability subclass IIe.

AmA—Alton fine gravelly loam, 0 to 3 percent slopes. This nearly level soil is deep and well drained and somewhat excessively drained. It formed in beach and deltaic deposits that are dominantly sand and gravel. This soil is on ridgetops, terraces, and remnant deltas. Areas of this soil range from 5 to 100 acres or more and are generally oblong.

Typically, this soil has a surface layer of very friable, dark grayish brown fine gravelly loam about 9 inches thick. The subsoil extends to a depth of about 30 inches. It is yellowish brown fine gravelly loam in the upper part and dark yellowish brown fine very gravelly sandy loam in the lower part. The substratum is loose, dark brown fine very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of slightly wetter Phelps soils in small depressions. Also included are small areas of the sandy Colonie soils, the gravelly Palmyra soils, and the shaly Blasdell soils. A few included areas are gently sloping. Included wet spots and sand spots are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

The permeability of this Alton soil is moderately rapid in the subsoil and rapid to very rapid in the substratum. The available water capacity in the root zone is low to moderate, and runoff is slow. Gravel makes up 20 to 35 percent of the surface layer and consists mostly of pebbles less than one-half inch in diameter. Unless this soil is limed, reaction is strongly acid or very strongly acid in the surface layer and strongly acid to neutral in the subsoil.

This soil is suitable for farming. Most of the acreage is cultivated and used for vegetables.

This Alton soil is well suited to cultivated crops and is especially productive for selected vegetable crops. Fine gravel, summer droughtiness, and rapid leaching of nutrients are the main limitations. This nearly level soil responds well to irrigation during extended dry periods and is somewhat easier to irrigate than the gently sloping Alton soils. Management should include additions of large quantities of organic matter and fertilizer during the growing season. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and rotating crops help maintain good tilth and increase the organic matter content. Increasing the organic matter content improves the available water capacity of the soil.

This soil is also suited to hay and pasture. Overgrazing when the soil is dry can cause the loss of the forage plants.

Timber production on this soil is good. There are generally no limitations to the use of equipment on this soil. Seedling mortality is generally not a problem, but seedlings should be planted in the spring when the soil is moist. Removing brush, careful planting, and fertilizing improve seedling survival.

This soil is suited to many urban uses. The pollution of the water table is a hazard if the soil is used for septic tank absorption fields because the substratum is rapidly to very rapidly permeable. Although small, gravel can be bothersome in landscaping and seeding lawns. Frequent fertilization and irrigation help maintain grass and shrubs. Some areas of this soil are suitable for athletic fields and other uses that require a nearly level site, although fine gravel and a slight tendency to droughtiness are minor limitations.

This Alton soil is in capability subclass IIs.

AmB—Alton fine gravelly loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained and somewhat excessively drained. It formed in beach and deltaic deposits. This soil is on ridges, undulating terraces, and remnant deltas. Areas of this soil range from 5 to 100 acres or more and are generally oblong.

Typically, this soil has a surface layer of very friable, dark grayish brown fine gravelly loam about 9 inches thick. The subsoil extends to a depth of about 30 inches. It is yellowish brown fine gravelly loam in the upper part and dark yellowish brown fine very gravelly sandy loam in the lower part. The substratum is loose, dark brown fine very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of slightly wetter Phelps soils in small depressions. Also included are small areas of the sandy Colonie soils, the gravelly Palmyra soils, and the shaly Blasdell soils. Included wet spots and sand spots are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

The permeability of this Alton soil is moderately rapid in the subsoil and rapid to very rapid in the substratum. The available water capacity in the root zone is low to moderate, and runoff is slow. Gravel makes up 20 to 35 percent of the surface layer and consists mostly of pebbles less than one-half inch in diameter. Unless this soil is limed, reaction is strongly acid or very strongly acid in the surface layer and strongly acid to neutral in the subsoil.

This soil is suited to farming. Most of the acreage is cultivated and used for vegetables.

This Alton soil is suited to cultivated crops and is especially productive for selected vegetable crops. The slight erosion hazard, droughtiness in midsummer, gravel, and the rapid leaching of nutrients are the main limitations. Tillage of row crops or clean-cultivated crops should be on the contour as much as possible to control erosion. The soil responds well to irrigation during extended dry periods but is somewhat more difficult to irrigate than the nearly level Alton soils. Fertilizer should be applied at intervals during the growing season. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and rotating crops help maintain tilth and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil.

Hay and pasture crops do well on this soil, especially deep-rooted forage plants, such as alfalfa. Overgrazing when the soil is dry can cause the loss of the pasture plants.

Timber production on this soil is good. Although the erosion hazard is slight, logging roads and skid trails should be on the contour or across the slope wherever possible. There are generally no limitations to the use of equipment on this soil. Seedling mortality is generally not a problem, but seedlings should be planted in the spring when the soil is moist. Removing brush, careful planting, and fertilizing improve seedling survival.

This soil is suited to many urban uses. The main limitations are a slight erosion hazard, the hazard of water pollution by septic tank absorption fields, and fine gravel in the surface layer. Removal of vegetation should be held to a minimum and plant cover should be established as quickly as possible to prevent erosion. Frequent fertilization and irrigation help maintain grass and shrubs.

This Alton soil is in capability subclass IIs.

AmC—Alton fine gravelly loam, 8 to 15 percent slopes. This sloping soil is deep and well drained and somewhat excessively drained. It formed in glacial outwash and beach deposits. This soil is on the side slopes of remnant beach ridges and on side slopes along dissecting streams. Areas of this soil are generally oblong and range from 5 to 30 acres.

Typically, this soil has a surface layer of very friable, dark brown fine gravelly loam about 9 inches thick. The subsoil extends to a depth of about 30 inches. It is yellowish brown fine gravelly loam in the upper part and dark yellowish brown fine very gravelly sandy loam in the lower part. The substratum is loose, dark brown fine very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of slightly wetter Phelps soils in small depressions and along seep spots. Also included are small areas of the sandy Colonie soils, the gravelly Palmyra soils, and the shaly Blasdell soils. Included wet spots and sand spots are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

The permeability of this Alton soil is moderately rapid in the subsoil and rapid to very rapid in the substratum. The available water capacity in the root zone is low to moderate, and runoff is medium. Gravel makes up 20 to 35 percent of the surface layer and consists of pebbles less than one-half inch in diameter. Unless this soil is limed, reaction is strongly acid or very strongly acid in the surface layer and strongly acid to neutral in the subsoil.

This soil is suited to farming. Although most of the acreage is in woodland, some cultivated areas are used for field crops.

This Alton soil is moderately suited to cultivated crops, but a moderate hazard of erosion, midsummer droughtiness, and rapid leaching of nutrients are limitations. Row crops can be grown more intensively if they are suitable for planting in tilled sod, in crop residues, or in cover crops in a no-plow cropping system. To conserve soil and moisture, management should include keeping tillage to a minimum, tilling across slope, using winter cover crops, including sod crops in the cropping system, and adding small quantities of nutrients at frequent intervals during the growing season. This soil is not well suited to irrigation because of the erosion hazard. Deep-rooted pasture plants do well on this soil, but overgrazing should be avoided during the drier summer months.

Timber production on this soil is good. Logging roads and skid trails should be on the contour or across the slope wherever possible to minimize the hazard of erosion. There are minor limitations to the use of equipment on this soil. Seedling mortality is generally not a problem, but seedlings should be planted in the spring when the soil is moist. Removing brush and careful planting and fertilizing improve seedling survival.

This soil is moderately suited to urban uses. The main limitations are slope, the possible pollution of water by septic tank absorption fields, and fine gravel in the surface layer. Large construction sites need some form of sediment control, such as sediment basins. The removal of vegetation on construction sites should be held to a minimum, and plant cover should be established as quickly as possible. Frequent fertilization and irrigation help maintain grass and shrubs.

This Alton soil is in capability subclass IIIe.

AnB—Alton gravelly loam, silty substratum, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It formed in gravelly glacial outwash deposits, 40 inches or more thick, over lake-laid silt and very fine sand deposits. This soil is on undulating outwash plains and terraces. Areas of this soil are generally oblong or irregular in shape and range from 3 to 50 acres.

Typically, this soil has a surface layer of dark grayish brown fine gravelly loam about 8 inches thick. The subsoil extends to a depth of about 30 inches. It is yellowish brown fine gravelly loam in the upper part and dark yellowish brown fine very gravelly sandy loam in the lower part. The substratum, to a depth of 50 inches, is dark brown fine very gravelly loamy sand and is underlain by strata of silt and very fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Scio and Rhinebeck soils. The moderately well drained Scio soils are silty and do not have coarse fragments. The somewhat poorly drained Rhinebeck soils are in depressional areas and along drainageways and formed in dominantly clayey sediments. Also included are small areas of the Alton soils that are underlain by layers of silt and very fine sand. In a few places the underlying silt and very fine sand is within 40 inches of the surface. Areas of included soils are 1/4 acre to 3 acres.

The permeability of this Alton soil is moderately rapid in the subsoil, rapid or very rapid in the gravelly substratum, and moderate to rapid in the underlying silty deposits. The available water capacity is low to moderate, and runoff is medium. Bedrock is at a depth of more than 5 feet. Gravel makes up 20 to 35 percent of the surface layer. Unless this soil is limed, reaction is strongly acid or very strongly acid in the surface layer and strongly acid to neutral in the subsoil.

This soil is suitable for farming, and most of the acreage is farmed. Some areas are used for urban development.

This Alton soil is suited to cultivated crops. Occasional stones or gravel and droughtiness are the main limitations for cultivated crops. This soil has a somewhat better available water capacity than the Alton soils that do not have a silty substratum. Erosion is a slight hazard. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops improve tilth and help maintain the organic matter content. Irrigation is needed if this soil is intensively cropped.

Pasture and hay crops do well on this soil, especially deep-rooted forage plants. Overgrazing during the drier summer months can cause the loss of the pasture seedings.

Timber production on this soil is good. Although erosion is generally not a hazard, logging trails should be placed across the slope wherever possible to minimize any hazard of trail gullying. Removing brush and planting seedlings early in the spring when the soil is moist help insure seedling survival. Machine planting of seedlings is practical on large areas of this soil, but gravel can be bothersome.

This Alton soil is moderately suited to many urban uses. There are few limitations to its use for septic tank absorption fields, except that there is a danger of pollution of the ground water because the substratum is rapidly or very rapidly permeable. Because of the unstable silty substratum, sloughing is a problem if excavations are made in this soil. Plant cover should be maintained on construction sites as much as possible to prevent erosion. Frequent watering and fertilization help maintain grass and shrubs. This soil is only a fair source of sand and gravel because of the underlying silty strata.

This Alton soil is in capability subclass IIs.

AnC—Alton gravelly loam, silty substratum, 8 to 15 percent slopes. This sloping soil is deep and well drained. It formed in gravelly glacial outwash deposits 40 inches or more thick, over lake-laid silt and very fine sand deposits. This soil is on rolling outwash plains and on the sides of ridges and small hills. Areas of this soil are oval or irregular in shape and range from 3 to 40 acres.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 8 inches thick. The subsoil extends to a depth of 30 inches. It is yellowish brown gravelly loam in the upper part and dark yellowish brown very gravelly sandy loam in the lower part. The substratum is dark brown very gravelly loamy sand to a depth of 50 inches and is underlain by strata of silt and very fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Allard and Rhinebeck soils. The Allard soils are in areas of gravelly outwash deposits mantled by silty deposits. The somewhat poorly drained Rhinebeck soils are in depressions and along drainageways and formed in dominantly clayey sediments. Also included are small areas of the Alton soils that are not underlain by strata of silt and very fine sand. In a few places, the underlying strata of silt and very fine sand are at a depth of less than 40 inches. Areas of included soils are 1/4 acre to 3 acres.

The permeability of this Alton soil is moderately rapid in the subsoil, rapid or very rapid in the gravelly substratum, and moderate to rapid in the underlying silty sediments. The available water capacity is low to moderate, and runoff is medium. Bedrock is at a depth of more than 5 feet. Gravel makes up 15 to 35 percent of the surface layer. Unless the soil is limed, reaction is strongly acid or very strongly acid in the surface layer and medium acid to neutral in the subsoil.

This soil is moderately suitable for farming. It has some limitations for urban uses. Most areas are wooded or farmed.

This Alton soil is moderately suited to cultivated crops. Slope, gravel in the surface layer, and droughtiness are the main limitations, and erosion also needs to be controlled. Occasional surface stones and gravel can be bothersome in cultivating some crops and cause excessive wear of machinery. Maintaining sod or winter cover crops and controlling surface runoff also help control erosion on this soil. Keeping tillage to a minimum, tilling across slope, using cover crops, adding fertilizer, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops that include a high proportion of sod crops improve tilth, maintain the organic matter content, and reduce the hazard of erosion.

Some areas are better suited to hay or pasture than to cultivated crops. Overgrazing when the soil is extremely dry can cause the loss of the pasture seeding and increase the hazard of erosion.

Timber production on this soil is good. Erosion is a slight hazard, and logging trails should be placed across the slope to prevent trail gullying. Planting trees early in spring when the soil is moist reduces seedling mortality.

This soil is moderately suited to some urban and recreational uses. Slope, droughtiness, and gravel in the surface layer are limitations for many uses. The pollution of ground water is a hazard if the soil is used for septic tank absorption fields, because the substratum is rapidly or very rapidly permeable. Because of the unstable silty substratum, sloughing is a problem if excavations are made in this soil. Vegetative cover should be maintained on construction sides as much as possible to prevent erosion. Frequent watering and fertilization help maintain grass and shrubs. This soil is only a fair source of sand and gravel because of the silty strata in the substratum.

This Alton soil is in capability subclass IIIe.

AoA—Angola silt loam, 0 to 3 percent slopes. This nearly level soil is 20 to 40 inches deep to shale bedrock and is somewhat poorly drained. It formed in glacial till that has a significant component of shale fragments. Usually, this soil is on the flat parts of broad, shelflike landforms characteristic of the fringes of the upland plateau. Areas of this soil are generally oblong and range from 5 to 200 acres.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsurface layer is mottled, grayish brown silt loam 2 inches thick. The subsoil is firm, mottled, dark grayish brown light silty clay loam 15 inches thick. The substratum is firm, mottled, dark grayish brown shaly heavy silt loam 4 inches thick. Shale bedrock is at a depth of 30 inches.

Included with this soil in mapping are small areas of the better drained Aurora soils on knolls and slight rises, a few spots of the deep Darien soils, and areas of the strongly acid Orpark soils. Occasionally, a soil similar to the Angola soil but less than 20 inches deep to bedrock is included. Included wet spots are indicated by a special symbol on the soil map. Areas of included soils are 1/4 acre to 3 acres.

The perched seasonal high water table in this Angola soil rises into the subsoil from December through May. The permeability is slow in the subsoil. The available water capacity is moderate to low, and runoff is medium. The root zone is limited to the soil above the shale bedrock, which is at a depth of 20 to 40 inches. Rock fragments make up 0 to 15 percent of the surface layer and are mostly shale. The subsurface layer and subsoil are medium acid to mildly alkaline.

Some areas of this soil are used for crops or pasture, but many areas are idle or wooded.

This Angola soil is moderately suited to cultivation, but seasonal wetness and moderate depth to bedrock are limitations. Drainage is difficult to install because the bedrock is close to the surface. Without drainage, planting is delayed in the spring because of seasonal wetness. If cultivated crops are grown, using cover crops, keeping tillage to a minium, incorporating crop residues into the soil, and rotating crops help maintain tilth and improve the organic matter content.

Undrained areas are suited to pasture and some hay crops. Restricting grazing during the spring and other wet periods prevents trampling and possible loss of the pasture seedings.

The potential of this soil for wood crops is fair. Seasonal wetness is a limitation to the use of equipment on this soil and increases seedling mortality. Brush removal and careful planting improve seedling survival. The uprooting of trees during windstorms can be a hazard because of the shallow rooting depth.

Moderate depth to bedrock and seasonal wetness seriously limit many urban uses of this soil. Excavations are costly because of the bedrock. Basements need protection from underground seepage. Seasonal wetness is a limitation for many recreational uses.

This Angola soil is in capability subclass IIIw.

AoB—Angola silt loam, 3 to 8 percent slopes. This gently sloping soil is 20 to 40 inches deep to shale bedrock and somewhat poorly drained. It formed in glacial till deposits that have a significant component of shale fragments. Usually, this soil is on shelflike and steplike landforms in the upland plateau fringe area. Areas of this soil are generally oblong and range from 5 to 200 acres.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsurface layer is mottled, grayish brown silt loam 2 inches thick. The subsoil is firm, mottled, dark grayish brown light silty clay loam 15 inches thick. The substratum is firm, mottled, dark grayish brown shaly heavy silt loam about 4 inches thick. Shale bedrock is at a depth of 30 inches.

Included with this soil in mapping are small areas of the better drained Aurora soils on knolls and slight rises and a few spots of the deep Darien soils and the strongly acid Orpark soils. Occasionally, a soil that is similar to the Angola soils but less than 20 inches deep to bedrock is included. Included wet spots are indicated by a special symbol on the soil map. Areas of included soils are 1/4 acre to 3 acres.

The perched seasonal high water table in this Angola soil rises into the subsoil from December through May. Permeability is slow in the subsoil. The available water capacity is moderate to low, and runoff is medium to rapid. The root zone is limited to the soil above the shale bedrock, which is at a depth of 20 to 40 inches. Rock fragments make up 0 to 15 percent of the surface layer and are mostly shale. The subsurface layer and subsoil are medium acid to mildly alkaline.

Some areas of this soil are used for crops or pasture, but many areas are idle or wooded.

This Angola soil is moderately suited to cultivated crops, but seasonal wetness and moderate depth to bedrock are limitations. Drainage is difficult to install because the bedrock is close to the surface. Without drainage, planting is delayed in the spring because of seasonal wetness. Erosion is a hazard in intensively cultivated areas. If cultivated crops are grown, tilling on the contour, using cover crops, keeping tillage to a minimum, incorporating crop residues into the soil, and rotating crops help maintain soil tilth, improve the organic matter content, and reduce the hazard of erosion.

Undrained areas are suited to pasture and some hay crops. Restricting grazing during the spring and other wet periods prevents trampling and possible loss of the pasture seedings.

The potential of this soil for wood crops is fair. Seasonal wetness is a limitation to the use of equipment and increases seedling mortality. Brush removal and careful planting improve seedling survival. The uprooting of trees during windstorms can be a hazard because of the shallow rooting depth.

Shallowness to bedrock and seasonal wetness seriously limit many urban uses of this soil. Excavations are costly because of the bedrock. Basements need protection from underground seepage. Interceptor drains placed upslope from foundations help alleviate the seepage problem. Seasonal wetness is a limitation for many recreational uses.

This Angola soil is in capability subclass IIIw.

ApA—Appleton silt loam, 0 to 3 percent slopes. This nearly level soil is somewhat poorly drained. It formed in glacial till deposits. This soil is on lowland till plains. Most areas are irregular in shape and mostly range from 10 to 50 acres, with some areas of 100 acres or more.

Typically, this soil has a surface layer of very dark grayish brown silt loam 9 inches thick. The subsurface layer is pinkish gray loam about 6 inches thick. At a depth of 15 inches, this layer merges and interfingers into the upper part of the subsoil. The subsoil, which extends to a depth of 29 inches, is firm, reddish brown gravelly heavy silt loam. The substratum is firm, reddish brown gravelly loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of the similar Ovid and Kendaia soils and a few areas of Newstead soils, in which limestone bedrock is at a depth of 20 to 40 inches. Also included, in a few depressional areas or drainageways, are areas of the poorly drained or very poorly drained Lyons soils. Included wet spots, sand spots, and stony spots are indicated by special symbols on the soil map. Areas of included soils are 1/4 acre to 3 acres.

There is a perched seasonal high water table in the upper part of the subsoil from December through May. Rooting depth is somewhat restricted by the seasonal high water table, but some roots will extend deeper as the water table recedes in the summer. The permeability of this Appleton soil is moderately slow or slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. Gravel makes up 5 to 15 percent of the surface layer. Reaction is slightly acid to neutral in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is moderately suited to farming. It has serious limitations for most urban uses. Most of the acreage is cultivated or used for pasture, but some areas are idle or wooded.

This Appleton soil is only moderately suited to cultivated crops, unless drained. If properly drained, it can be quite productive for most crops grown in the region. Seasonal wetness and moderately slow or slow permeability are the main limitations to crop growth. Tilling this soil when it is wet destroys tilth, which causes crusting and clodding when the soil dries and creates a poor environment for root development. Keeping tillage to a minimum, plowing at the proper soil moisture content, using green manure crops, and including sod crops in the cropping system promote good tilth and increase the organic matter content. Subsurface drains usually function well in this soil in combination with open ditches.

Overgrazing and grazing when wet are major concerns of pasture management. Grazing when the soil is wet causes compaction and trampling of plants, which can lead to the loss of the pasture seedings.

The potential of this soil for wood crops is fair. Seasonal wetness is a limitation to use of equipment on this soil and increases seedling mortality. Brush removal and careful planting improve seedling survival. Trees are somewhat susceptible to uprooting during windstorms because the rooting depth is restricted by seasonal wetness.

The seasonal high water table and moderately slow or slow permeability are serious limitations for many urban uses of this soil. Proper landscaping and drains around foundations help overcome the problem of seasonal wetness. Wetness is also a limitation for most recreational uses. Some areas provide good sites for ponds.

This Appleton soil is in capability subclass IIIw.

ApB—Appleton silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in glacial till deposits. This soil is on concave foot slopes on lowland till plains. A few areas are undulating. Most areas of this soil are oblong and range from 5 to 50 acres.

Typically, this soil has a surface layer of very dark grayish brown silt loam 9 inches thick. The subsurface layer is pinkish gray loam about 6 inches thick. The subsoil extends to a depth of 29 inches. It is firm, reddish brown gravelly heavy silt loam. The substratum to a depth of 60 inches or more is firm, reddish brown gravelly loam.

Included with this soil in mapping are small areas of the moderately well drained Lima soils on slight rises and a few areas of Ovid soils that have a slightly higher clay content in the subsoil than this Appleton soil. Some areas include small wet spots, sandy spots, and stony spots that are indicated by special symbols on the soil map. Areas of included soils are 1/4 acre to 3 acres.

There is a perched seasonal high water table in the upper part of the subsoil from December through May. Rooting depth is limited by the seasonal high water table, but some roots extend deeper as the water table recedes in the summer. The permeability of this Appleton soil is moderately slow or slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is medium. Some runoff is commonly received from higher adjacent soils. Gravel makes up 5 to 15 percent of the surface layer. Reaction is slightly acid to neutral in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is moderately suited to farming. It has serious limitations for most urban uses. Most of the acreage is cultivated or used for pasture, but some areas are idle or wooded.

This Appleton soil is only moderately suited to cultivated crops, unless drained. If properly drained, it can be quite productive for most crops grown in the region. Interceptor drains are effective in diverting and removing runoff from higher adjacent soils. Subsurface drains usually function well if adequate outlets are available. Using cover crops, tilling on the contour, and including sod crops in the cropping system help maintain good tilth and reduce the hazard of erosion.

Overgrazing and grazing when the soil is wet are major concerns of pasture management. Restricting grazing when the soil is wet prevents compaction and trampling of the pasture plants and helps maintain pasture seedings. This soil can be used for hay crops that can withstand early seasonal wetness.

The potential of this soil for wood crops is fair. Seasonal wetness is a minor limitation to use of equipment on this soil and increases seedling mortality. Root development is somewhat restricted by seasonal wetness, and tree uprooting can be a problem during windstorms. Brush removal and careful planting improve the chances of seedling survival.

The seasonal high water table and moderately slow or slow permeability are serious limitation for most urban uses of this soil. Interceptor drains to remove runoff, drains around foundations, and proper landscaping reduce the problem of seasonal wetness for dwellings. Seasonal wetness also limits most recreational uses of this soil.

This Appleton soil is in capability subclass IIIw.

ArB—Arkport very fine sandy loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It formed in sandy deltaic and lacustrine deposits. This soil is on the tops of remnant deltas. Some areas are undulating. Areas of this soil are generally irregular in shape and range from 5 to 20 acres, and a few areas cover 50 acres or more.

Typically, this soil has a surface layer of dark grayish brown very fine sandy loam about 4 inches thick. The subsoil is 52 inches thick. The upper part of the subsoil is very friable, strong brown very fine sandy loam. The middle part is friable, brown very fine sandy loam. The lower part is pale brown loamy very fine sand that has thin horizontal bands of loam. The substratum is light grayish brown strata of loamy fine sand and very fine sand to a depth of 70 inches or more.

Included with this soil in mapping are small areas of the nearly level Arkport soils and the slightly wetter Galen soils. Also included are a few areas of the Colonie soils that have a loamy fine sand surface layer but do not have loamy bands in the subsoil and a few spots of the silty Allard soils. A few small depressions that are very wet and small spots that have gravel in the surface layer are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

The permeability of this Arkport soil is moderately rapid throughout. The available water capacity is moderate to low, and runoff is medium to slow. Bedrock is at a depth of more than 5 feet, and there are usually no small stones in this soil. Reaction is very strongly acid to neutral in the surface layer and upper part of the subsoil.

This soil is suited to both farm and urban uses. Most of the acreage is cultivated, but several areas are idle or wooded.

This Arkport soil is well suited to cultivated crops and hay crops. It is among the easiest soils in the county to cultivate because it is very friable, has a very fine sandy loam surface layer, and does not contain gravel. It can be an especially productive soil for certain vegetable crops. The slight susceptibility to erosion, moderately low natural fertility, and droughtiness during dry periods are the main management problems. Intensive cultivation of row crops is helped by tilling on the contour, using cover crops, occasionally including sod crops in the cropping system, and keeping tillage to a minimum. These practices reduce the hazard of erosion, help maintain good tilth, and increase the organic matter content; thereby improving the available water capacity of the soil. This soil is suitable for irrigation. If it is pastured, overgrazing when the soil is dry should be avoided to prevent the loss of the pasture seedings.

The potential of this soil for wood crops is high. Although seedling mortality is generally low, planting early in the spring when the soil is moist helps insure seedling survival. This soil is well suited to machine planting of tree seedlings.

This soil has few limitations for most urban uses. There is a hazard of pollution of the ground water from septic tank and leach field systems because the substratum is moderately rapidly permeable. Frequent fertilization and irrigation help maintain lawns and shrubs.

This Arkport soil is in capability subclass IIe.

ArC—Arkport very fine sandy loam, 8 to 15 percent slopes. This sloping soil is deep and well drained. It formed in lacustrine deposits that are dominantly sand on remnant deltas. The short, convex slopes of this soil receive little or no runoff. Most areas of this soil are oblong, and they range from 5 to 40 acres.

Typically, this soil has a surface layer of very dark grayish brown very fine sandy loam 4 inches thick. The subsoil is about 52 inches thick. The upper part of the subsoil is very friable, strong brown very fine sandy loam; the middle part is friable, brown very fine sandy loam;

and the lower part is pale brown loamy very fine sand with thin horizontal bands of dark brown loam. The substratum to a depth of 70 inches or more is light grayish brown loamy fine sand and very fine sand.

Included with this soil in mapping are small areas of a soil that has a silt loam surface layer. Also included are areas of the sandy Colonie soils that do not have loamy bands in the subsoil as does the Arkport soil. A few included wet spots and drainageways are indicated on the soil map by special symbols. Areas of included soils range from 1/4 acre to 3 acres.

The permeability of this Arkport soil is moderately rapid throughout. The available water capacity is moderate to low, and runoff is medium. Bedrock is at a depth of more than 5 feet, and there is usually no gravel in the soil. In unlimed areas, the surface layer and upper part of the subsoil are very strongly acid to neutral.

This soil is moderately suited to some farm and urban uses. Most of the acreage is idle or wooded, but some areas are cultivated.

This Arkport soil is moderately suited to cultivated crops, but slope is a limitation. Hay crops are suited to most areas. If cultivated crops are grown, practices that conserve soil and water are desirable. Keeping tillage to a minimum, using a no-plow tillage system, tilling on the contour, stripcropping, and returning crop residues to the soil help control erosion. Stripcropping and contour tillage may not be practical in areas where the slope is irregular. Including sod crops in the cropping system, using cover crops, and returning crop residues to the soil help maintain good tilth and increase the organic matter content. Increasing the organic matter content improves the available water capacity of the soil.

Overgrazing should be avoided, especially during dry periods, to prevent the loss of the pasture seedings. Overgrazing increases the hazard of erosion.

The potential of this soil for wood crops is high. Although the erosion hazard is slight, logging roads and skid trails should be on the contour or across the slope wherever possible. Seedling mortality is generally not a problem, but planting early in the spring when the soil is moist helps insure seedling survival.

Slope and susceptibility to erosion are limitations for many urban uses of this soil. Removal of vegetation should be held to a minimum and plant cover established as quickly as possible on construction sites. Large construction sites need some form of sediment control, such as sediment basins. Frequent fertilization and irrigation help maintain lawns and shrubs.

This Arkport soil is in capability subclass IIIe.

ArD—Arkport very fine sandy loam, 15 to 25 percent slopes. This moderately steep soil is deep and well drained. It formed in lacustrine deposits that are dominantly sand. This soil is on the sides of dissected deltas and on some lower valley sides. Slopes are usually short. Most areas of this soil are oblong and range from 5 to 50 acres.

Typically, this soil has a surface layer of very dark grayish brown very fine sandy loam 4 inches thick. The subsoil is about 52 inches thick. The upper part of the subsoil is very friable, strong brown very fine sandy loam; the middle part is friable, brown very fine sandy loam; and the lower part is pale brown loamy very fine sand with thin horizontal bands of dark brown loam. The substratum to a depth of 70 inches or more is light grayish brown loamy fine sand and very fine sand.

Included with this soil in mapping are small areas of a soil that has a silt loam surface layer. Also included are areas of the sandy Colonie soils that do not have the loamy bands that are in the subsoil of the Arkport soil. A few included gravel spots, wet spots, and drainageways are indicated on the soil map by special symbols. In a few areas, the surface layer is eroded. The areas of included soils range from 1/4 acre to 3 acres.

The permeability of this Arkport soil is moderately rapid throughout. The available water capacity is moderate to low, and runoff is rapid. Bedrock is at a depth of more than 5 feet, and there is usually no gravel in the soil. In unlimed areas, the surface layer and upper part of the subsoil are very strongly acid to neutral.

This soil is poorly suited to most farm and urban uses. Most of the acreage is in woodland, but some areas are pastured.

This Arkport soil is poorly suited to cultivated crops because of the moderately steep slopes and associated erosion hazard. Row crops can be grown occasionally if erosion is controlled.

Some areas are suited to hay crops, but the operation of harvesting equipment is difficult because of the slope. Many areas are suitable for pasture, but overgrazing should be avoided, especially during dry periods, to prevent the loss of pasture seedings. Erosion can be a serious hazard in overgrazed areas where the vegetative cover is sparse.

The potential of this soil for wood crops is high. Erosion is usually not a hazard in wooded areas, but locating logging trails across the slope wherever possible reduces trail gullying. Because of the moderately steep slope, the use of planting and harvesting equipment is somewhat restricted.

Slope and susceptibility to erosion are serious limitations for many urban uses of this soil. Removal of vegetation should be held to a minimum and plant cover established as quickly as possible on construction sites. Large construction sites need some form of sediment control, such as sediment basins. Excavation of foot slopes can result in mass slumps or slides. Fertilization helps maintain a thick vegetative cover, which decreases the hazard of erosion.

This Arkport soil is in capability subclass IVe.

ArE—Arkport very fine sandy loam, 25 to 40 percent slopes. This steep soil is deep and well drained. It formed in lacustrine deposits that are dominantly sand. This soil is on dissected remnant deltas or along valley sides. Slopes are commonly short and slightly convex. Most areas of this soil are oblong and range from 10 to 50 acres.

Typically, this soil has a surface layer of very dark grayish brown very fine sandy loam 4 inches thick. The subsoil is about 52 inches thick. The upper part of the subsoil is very friable, strong brown very fine sandy loam; the middle part is friable, brown very fine sandy loam; and the lower part is pale brown loamy very fine sand with thin horizontal bands of dark brown loam. The substratum to a depth of 70 inches or more is light grayish brown loamy fine sand and very fine sand.

Included with this soil in mapping are small areas of a soil that has a silt loam surface layer. Also included are areas of the sandy Colonie soils that do not have the loamy bands that are in the subsoil of the Arkport soil. A few included gravelly spots, wet spots, and drainageways are indicated on the soil map by special symbols. The areas of included soils range from 1/4 acre to 3 acres.

The permeability of this Arkport soil is moderately rapid throughout. The available water capacity is moderate to low, and runoff is rapid. Bedrock is at a depth of more than 5 feet, and there is usually no gravel in the soil. In unlimed areas, the surface layer and upper part of the subsoil are very strongly acid to neutral.

This soil is poorly suited to farm and urban uses. Most of the acreage is in woodland.

This Arkport soil is poorly suited to cultivated crops. Slope is a serious limitation for this use. Hay crops can be grown, but the operation of equipment on this steep soil is extremely difficult. Some areas are suited to permanent pasture, but reseeding and applying fertilizer are very difficult. Overgrazing during dry periods can cause the loss of the pasture plants and results in a serious erosion hazard.

The potential of this soil for wood crops is fair to good. Erosion is a serious hazard. Locating logging roads on the contour or across the slope wherever possible helps eliminate trail gullying. Equipment use is seriously limited because of the steep slopes.

Excessive slope and susceptibility to erosion are very serious limitations for urban uses of this soil. Removal of vegetation should be held to a minimum and plant cover established as quickly as possible on construction sites. Large construction sites need some form of sediment control, such as sediment basins. Frequent fertilization helps maintain a thick vegetative cover, which reduces the hazard of erosion. Slumps or slides are a hazard if foot slopes are excavated.

This Arkport soil is in capability subclass VIe.

AuC—Aurora shaly silt loam, 8 to 15 percent slopes. This sloping soil is moderatly well drained soil. It formed in glacial till deposits less than 40 inches deep to shale bedrock. This soil is on till plains where the topography is strongly influenced by the underlying bedrock. Areas of this soil are usually oblong and range from 5 to 30 acres.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 9 inches thick. The subsurface layer is friable, pale brown shaly silt loam about 4 inches thick. The upper part of the subsoil is a firm, olive brown shaly silty clay loam about 11 inches thick, and the lower part is firm, dark grayish brown shaly silty clay loam about 9 inches thick. Olive gray to very dark grayish brown shale bedrock is at a depth of 33 inches.

Included with this soil in mapping are areas of the somewhat poorly drained Angola soils along drainageways and on concave foot slopes. Also included are a few areas of the Danley soils that are more than 40 inches deep to bedrock. In some areas, bedrock is within 20 inches of the surface. Included seep spots and quarries are indicated by special symbols on the soil map. Included areas of this soil range from 1/4 acre to 2 acres.

This Aurora soil has a perched seasonal high water table in the lower part of the subsoil in the spring. Bedrock is at a depth of 20 to 40 inches and limits root penetration. Rock fragments, mainly shale, make up 15 to 30 percent of the surface layer. Permeability is slow in the subsoil and substratum. The available water capacity varies with depth to bedrock, but it generally is moderate to low. Runoff is medium. The surface layer is strongly acid to neutral, and the subsoil is medium acid to moderately alkaline.

This soil is moderately suited to farming but has serious limitations for most urban uses. Approximately half the acreage is used for pasture, hay, and cultivated crops, and the other half is idle or wooded.

This Aurora soil is moderately suited to cultivated crops and hay. Included wet spots and seep areas often require drainage for maximum utilization of fields. Open drains are usually easier to install than subsurface drains because bedrock is near the surface. Erosion is a serious hazard where cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, diversion ditches, cover crops, and sod crops reduce the erosion hazard, help maintain good tilth, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil.

Where this soil is pastured, overgrazing and grazing when wet are the main management concerns. Grazing when the soil is wet causes compaction and trampling of grasses which can lead to the loss of the pasture seedings.

The potential of this soil for wood crops is high. Although the hazard of erosion is slight, logging trails placed across the slope help eliminate trail gullying. Seedling mortality and uprooting of trees during windy periods are generally not serious hazards on this soil.

Slope, depth to bedrock, seasonal high water table, and slow permeability of the subsoil and substratum are serious limitations for many urban uses of this soil. Although excavations are costly, the shale bedrock usually is rippable with a backhoe. Foundations and basements are benefited by drains that reduce the wetness associated with the seasonal high water table and lateral seepage. Many areas are suitable for various recreational uses.

This Aurora soil is in capability subclass IIIe.

Be—Beaches. This is a miscellaneous area consisting of sandy or sandy and gravelly material deposited mostly by waves along beach fronts. Most areas are along the shores of Lake Erie. They are mostly narrow, long strips that conform to the shoreline. Some areas have been slightly altered by man to make them more useful for recreational purposes. Slope ranges from 0 to 8 percent.

Typically, these beach areas have a discontinuous layer of driftwood, sticks, and bark covering about 10 percent of the sandy surface. The sandy or gravelly material is usually light colored, and individual particles are rounded as the result of wave action. Beaches are usually devoid of live vegetation; however, some areas have coverings of washed-up algae, seaweeds, and other aquatic plants. Many areas are almost continually moist because of constant wave action.

Included in mapping are significant areas of riverwash, consisting mostly of gravel and cobblestones. These areas usually occur as fan deposits where large streams and creeks empty into lakes. Also included are areas where rock fill or railroad ties have been installed to control beach-front erosion.

Beaches are poorly suited to farming, urban uses, and woodland because they are inundated by waves during high water periods. Generally, the potential is poor for wildlife habitat, although sea gulls and some birds feed on dead prey and debris that wash up on the beach.

The suitability of these areas for recreational uses ranges from very good to poor. Most areas are suitable for swimming, sunbathing, and other beach activites. Other areas are not suitable because of location and variability of the soil material, especially in areas where streams and creeks empty into lakes. Onsite investigation is required for any proposed use.

Beaches are not assigned a capability subclass.

BfA—Benson very cherty loam, 0 to 3 percent slopes. This nearly level soil is somewhat excessively drained to excessively drained. It formed in glacial till that is underlain by bedrock 10 to 20 inches below the surface. This soil is on nearly flat benches at the edge of the upland plateau. Areas of this soil are irregular in shape and range from 5 to 100 acres or more.

Typically, this soil has a surface layer of friable, dark grayish brown very cherty loam 6 inches thick. The subsoil consists of friable, dark yellowish brown very cherty loam about 6 inches thick. The substratum consists of porous, brown very cherty loam about 3 inches thick. Hard, grayish cherty limestone bedrock is at a depth of 15 inches.

Included with this soil in mapping are small areas where the layer of soil over the limestone bedrock is less than 10 inches thick. Also included are areas of Wassaic soils that are underlain by bedrock at a depth of 20 to 40 inches. In some areas the surface layer is a cherty loam or loam that has a lower content of rock fragments. Included quarries are indicated by a special symbol on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

Bedrock is at a depth of 10 to 20 inches in this Benson soil. Rock fragments make up 35 to 55 percent of the surface layer. Rooting depth is limited by the underlying bedrock. Permeability is moderate throughout the soil. The available water capacity is very low or low, and runoff is slow. The surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

This soil is poorly suited to farming and most urban uses. Most of the acreage is idle or wooded. A few areas are urbanized.

This Benson soil is poorly suited to cultivated crops because of the shallow depth to bedrock, droughtiness, and numerous small rocks. Productivity is generally low, except in years of high rainfall. Conservation practices that increase organic matter content and thus increase the available water capacity of the soil are growing sod crops in the cropping system, using cover crops, returning of crop residues to the soil, and keeping tillage to a minimum. The excessive amount of cherty fragments can be a problem in planting fine-seeded crops and may cause excessive wear of machinery.

This soil can be used for pasture, but droughtiness in midsummer keeps forage yields low. Overgrazing can cause the loss of the pasture grasses, especially in dry periods.

The potential of this soil for wood crops is poor. Droughtiness causes a high rate of seedling mortality. Planting early in the spring when the soil is moist improves seedling survival. Uprooting of trees during windstorms is a hazard because of the shallow rooting depth.

The shallow depth to bedrock is a serious limitation for most urban uses of this soil. Blasting of the bedrock may be required for excavations. Lawns are difficult to establish because of droughtiness and the many small rock fragments in the soil. Frequent irrigation helps maintain grass and shrubs. Some areas are suitable for such recreational uses as picnic areas and camp areas.

This Benson soil is in capability subclass IIIs.

BfB—Benson very cherty loam, 3 to 8 percent slopes. This gently sloping soil is somewhat excessively drained to excessively drained. It formed in glacial till underlain by bedrock at a depth of 10 to 20 inches. This soil is on undulating or "stepped" benches near the limestone escarpment in the northern part of the county. Areas of this soil are irregular in shape or oblong and range from 5 to 50 acres or more.

Typically, this soil has a surface layer of friable, dark grayish brown very cherty loam about 6 inches thick. The subsoil is friable, dark yellowish brown very cherty loam about 6 inches thick. The substratum is porous, brown very cherty loam about 3 inches thick. Hard, grayish limestone bedrock is at a depth of 15 inches.

Included with this soil in mapping are small areas where the layer of soil over the limestone bedrock is less than 10 inches thick. Also included are areas of Wassaic soils that are underlain by bedrock at a depth of 20 to 40 inches. In some areas the surface layer is a cherty loam or loam that has a lower content of rocks. Included quarries are indicated by a special symbol on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

Bedrock is at a depth of 10 to 20 inches in this Benson soil. Rock fragments make up 35 to 55 percent of the surface layer. Rooting depth is limited by the underlying bedrock. Permeability is moderate throughout the soil. The available water capacity is very low or low, and runoff is medium. The surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

This soil is poorly suited to farming and most urban uses. Most of the acreage is idle or wooded. A few areas are urbanized.

This Benson soil is poorly suited to cultivated crops because of the shallow depth to bedrock, droughtiness, and numerous small rock fragments. Erosion is a hazard in intensively cropped areas. Productivity is generally low except in years of high rainfall. Conservation practices help control erosion and, by increasing organic matter content, improve the available water capacity of the soil. They include growing sod crops in the cropping system, using cover crops, returning crop residues to the soil, and keeping tillage to a minimum. The excessive amount of chert fragments can be a problem in planting fine-seeded crops and cause rapid wear of machinery. Tillage is greatly hindered where included spots of bedrock are less than 10 inches below the surface.

This soil can be used for pasture, but droughtiness in midsummer keeps forage yields low. Overgrazing can cause the loss of the pasture grasses, especially in dry periods.

The potential of this soil for wood crops is poor. Droughtiness causes a high rate of seedling mortality. Planting early in the spring when the soil is moist improves seedling survival. Uprooting of trees during windstorms is a hazard because of the shallow rooting depth.

The shallow depth to limestone bedrock is a serious limitation for most urban uses of this soil. Blasting may be required for excavations. Lawns are difficult to establish because of droughtiness and the many small rock fragments in the soil. Frequent irrigation helps maintain grass and shrubs.

This Benson soil is in capability subclass IIIe.

BgC—Benson very cherty loam, very rocky, 8 to 15 percent slopes. This sloping soil is somewhat excessively drained to excessively drained. It formed in glacial till underlain by bedrock at a depth of 10 to 20 inches. From 1 to 10 percent of the map unit consists of exposed ledges of limestone bedrock. This soil is on the sloping "stepped" face or front of the limestone escarpment in the northern part of the county. Areas of this soil are oblong and range from 5 to 40 acres or more.

Typically, this soil has a surface layer of friable, dark grayish brown very cherty loam about 6 inches thick. The subsoil is friable, dark yellowish brown very cherty loam about 6 inches thick. The substratum is porous, brown very cherty loam about 3 inches thick. Hard, grayish limestone bedrock is at a depth of 15 inches.

Included with this soil in mapping are many small areas where the layer of soil over the limestone bedrock is less than 10 inches thick. Also included are a few areas of Wassaic soils that are underlain by bedrock at a depth of 20 to 40 inches. In some areas the surface layer is cherty loam or loam that contain fewer rock fragments. Included quarries are indicated by a special symbol on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

Bedrock is dominantly at a depth of 10 to 20 inches in this Benson soil. Occasional rock outcrops appear as nearly vertical ledges. Small rock fragments make up 35 to 55 percent of the surface layer. Rooting depth is limited by the underlying bedrock. Permeability is moderate throughout the soil. The available water capacity is very low or low, and runoff is medium to rapid. This soil is medium acid to neutral in the surface layer and slightly acid to mildly alkaline in the subsoil.

This soil is poorly suited to farming and urban uses. Most of the acreage is idle or wooded. A few small areas are urbanized.

This Benson soil is very poorly suited to cultivated crops because of the occasional rock outcrops, shallow depth to bedrock, droughtiness, and the numerous small rock fragments. Erosion is a serious hazard if the soil is disturbed or cultivated. Productivity is generally low except in years of high rainfall. Conservation practices that help control erosion and, by increasing organic matter content, increase the available water capacity of the soil are growing sod crops in the cropping system, using cover crops, returning crop residues to the soil, keeping tillage to a minimum, tilling on the contour, and stripcropping where applicable. The excessive amount of cherty fragments can be a problem in planting fine-seeded crops and cause rapid wear of machinery. Tillage is severely hindered in areas of rock outcrop.

This soil can be used for pasture, but droughtiness in midsummer keeps forage yields low. Overgrazing can cause the loss of the pasture grasses, especially in dry periods.

The potential of this soil for wood crops is poor. Droughtiness causes a high rate of seedling mortality. Planting early in the spring when the soil is moist improves seedling survival. Machine planting may not be practical because of the outcroppings of bedrock. Uprooting of trees during windstorms is a hazard because of the shallow rooting depth.

The shallow depth to limestone bedrock and bedrock outcrops are serious limitations for most urban uses for this soil. Blasting may be required for excavations. Lawns are difficult to establish because of droughtiness and the many small rock fragments in the soil. Frequent irrigation helps maintain grass and shrubs.

This Benson soil is in capability subclass IVe.

BhB—Benson-Rock outcrop complex, 3 to 8 percent slopes. This complex consists of gently sloping, somewhat excessively drained to excessively drained Benson soils that are interrupted by outcrops of bedrock. The Benson soils formed in glacial till that is 10 to 20 inches deep over bedrock. This complex is on ridges and benches at the edge of the upland plateau where topography is strongly influenced by the underlying bedrock. Most areas are circular or irregular in shape and range from 10 to 50 acres or more.

The complex is about 60 percent Benson soils, 30 percent Rock outcrop, and 10 percent other soils. The soils and Rock outcrop form such an intricate pattern that they were not separated in mapping.

Typically, the Benson soils have a surface layer of friable, dark grayish brown very cherty loam about 6 inches thick. The subsoil is friable, dark yellowish brown very cherty loam about 5 inches thick. This is underlain by hard, grayish limestone bedrock at a depth of 12 inches. The Rock outcrop occurs as protruding ledges and exposed surfaces of the horizontally bedded rock.

Included in mapping, and making up about 5 percent of the complex, are areas of the Farmington soils that have a lower rock content than the similar Benson soils. A few areas are nearly level. Included quarries are indicated by a special symbol on the soil map. Areas of included soils range from 1/4 acre to 3 acres. In many areas, bedrock is at a depth of 0 to 10 inches.

In the Benson soils, bedrock is at a depth of 10 to 20 inches, and small rock fragments make up 35 to 55 percent of the soil. Rooting depth is limited by the bedrock. Permeability is moderate throughout the soil. The available water capacity is low or very low, and runoff is medium. The Benson soils are medium acid to neutral in the surface layer and slightly acid to mildly alkaline in the subsoil.

This complex is poorly suited to farming and urban development. Most areas are idle or wooded. A few areas are quarried for limestone rock.

This complex is not suited to cultivated crops because bedrock is near the surface and there are numerous outcrops of rock. Some areas are suitable for pasture, but droughtiness and bare spots of rock are limitations to the growth of pasture grasses.

The potential of this complex for wood crops is poor. Droughtiness increases seedling mortality, and outcrops of rock limit the use of planting and harvesting equipment. Uprooting of trees during windstorm is a hazard because of the shallow rooting depth.

The shallow depth to bedrock and numerous rock outcrops are serious limitations for most urban uses for this complex. Excavation is very difficult and may require blasting. The addition of topsoil may be required to establish lawns.

This Benson-Rock outcrop complex is in capability subclass VIs.

BlA—Blasdell shaly silt loam, 0 to 3 percent slopes. This nearly level soil is deep and well drained. It formed in water-sorted deposits high in content of shaly gravel. This soil is on beach ridges, terraces, and deltas. Most of the shale fragments were gouged from nearby rock strata or, if stream-deposited, from terraces upstream. Most areas are long and narrow and range from 5 to 100 acres or more.

Typically, this soil has a surface layer of very friable, dark grayish brown shaly silt loam about 8 inches thick. The subsoil extends to a depth of about 36 inches. It is yellowish brown very shaly silt loam in the upper part and dark yellowish brown very shaly loam in the lower part. The substratum to a depth of 60 inches or more is friable, brown very shaly loam.

Included with this soil in mapping are areas of the Farnham and Alton soils. The Farnham soils are in a few depressions and along drainageways. The Alton soils are slightly less acid in the subsoil than this Blasdell soil. In some areas the surface layer is gravelly loam. Included wet spots, sandy spots, gravel pits, and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

Small stones make up 15 to 35 percent of the surface layer of this Blasdell soil and are mostly shale. Permeability is moderately rapid in the subsoil and substratum. The available water capacity ranges from low to moderate, and runoff is slow. Bedrock is at a depth of more than 5 feet. In unlimed areas, reaction ranges from very strongly acid to medium acid in the surface layer and subsoil.

This soil is suitable for farming and urban uses. Most of the acreage is cultivated.

This Blasdell soil is well suited to most cultivated crops and hay crops. The low to moderate available water capacity is the main limitation to crop growth. Surface gravel can be a problem in planting and cultivating fine-seeded crops and can cause excessive wear of machinery. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and rotating crops increase organic matter content, which improves the available water capacity of the soil. Vegetable crops are suited to this soil where the climate is modified by Lake Erie and where irrigation water is available. Sprinkler irrigation systems are better adapted to this nearly level soil than to the gently sloping Blasdell soil. Overgrazing, particularly during dry periods, can cause the loss of the pasture plants.

The potential of this soil for wood crops is fair to good. Although seedling mortality is generally not a problem, seedlings should be planted very early in the spring when the soil is moist. Brush removal and careful planting help insure seedling survival.

This soil has few limitations for urban uses. If it is used for septic tank absorption fields, the main limitation is the possible pollution of ground water, because the substratum is moderately rapidly permeable. Seeding lawns can be difficult because of the high content of shale fragments in the soil. Frequent fertilization and irrigation help maintain grass and shrubs. Many areas are suitable for recreational uses that require a nearly level site, but the numerous shale fragments can be bothersome for some of these uses.

This Blasdell soil is in capability subclass IIs.

BlB—Blasdell shaly silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It formed in water-sorted deposits high in shaly gravel. This soil is on the crest of remnant beach ridges and on undulating terraces and remnant deltas. Most of the shale fragments were gouged from nearby rock strata or, in stream-deposited areas, from terraces upstream. Most areas are long and narrow or oblong and range from 5 to 100 acres or more.

Typically, this soil has a surface layer of very friable, dark grayish brown shaly silt loam 8 inches thick. The subsoil extends to a depth of 36 inches. It is yellowish brown very shaly silt loam in the upper part and dark yellowish brown very shaly loam in the lower part. The substratum to a depth of 60 inches or more is friable, brown very shaly loam.

Included with this soil in mapping are areas of the Farnham and Alton soils. The Farnham soils are in a few depressions and along drainageways. The Alton soils are slightly less acid in the subsoil than this Blasdell soil. In some areas the surface layer is finely gravelly loam. Also included in a few areas is a soil similar to this Blasdell soil that has a very firm subsoil and substratum. Included wet spots, sandy spots, gravel pits, and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

Small stone fragments make up 15 to 35 percent of the surface layer and are mostly shale. The permeability of this Blasdell soil is moderately rapid in the subsoil and substratum. The available water capacity ranges from low to moderate, and runoff is slow. Bedrock is at a depth of more than 5 feet. In unlimed areas, reaction ranges from very strongly acid to medium acid in the surface layer and subsoil.

This soil is suitable for farming and urban uses. Most of the acreage is cultivated.

This Blasdell soil is well suited to most cultivated crops and hay crops. The low to moderate available water capacity of the soil is the main limitation to crop growth. Surface gravel can be a problem in planting and cultivating of fine-seeded crops and can cause excessive wear of machinery. Erosion is a minor hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues in the soil, and rotating crops increase organic matter content, which improves the available water capacity of the soil. These practices and contour tillage reduce the hazard of erosion. Vegetable crops are suited to this soil where the climate is modified by Lake Erie if irrigation water is available. Sprinkler irrigation systems are not as well adapted to this soil as to the nearly level Blasdell soil. Overgrazing, particularly during dry periods, can cause the loss of the pasture plants.

The potential of this soil for wood crops is fair to good. Although seedling mortality is generally not a problem, seedlings should be planted very early in the spring when the soil is moist. Brush removal and careful planting help insure seedling survival.

This soil has few limitations for urban uses. If it is used for septic tank absorption fields, the main limitation is the possible pollution of ground water, because the substratum is moderately rapidly permeable. Seeding lawns can be difficult because of the high content of shale fragments in the soil. Frequent fertilization and irrigation help maintain grass and shrubs. Many areas are suitable for recreational uses.

This Blasdell soil is in capability subclass IIs.

BlC—Blasdell shaly silt loam, 8 to 15 percent slopes. This sloping soil is deep and well drained. It formed in water-sorted deposits high in content of shaly gravel. This soil is on the sides of remnant beach ridges, terraces, and remnant deltas. Most of the shale fragments were gouged from nearby rock strata or, in stream-deposited areas, from terraces upstream. Most areas are long and narrow or oblong and range from 5 to 50 acres.

Typically, this soil has a surface layer of very friable, dark grayish brown shaly silt loam about 8 inches thick. The subsoil extends to a depth of about 36 inches. It is yellowish brown very shaly silt loam in the upper part and dark yellowish brown very shaly loam in the lower part. The substratum to a depth of 60 inches or more is friable, brown very shaly loam.

Included with this soil in mapping are the Farnham and Alton soils. The Farnham soils are in a few depressions on foot slopes and along drainageways. The Alton soils are slightly less acid in the subsoil than this Blasdell soil. In some areas the surface layer is finely gravelly loam. Also included in a few areas is a soil similar to this Blasdell soil but that formed in glacial till deposits and has a firmer subsoil. Included wet spots, sandy spots, gravel pits, and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

Small stones make up 15 to 35 percent of the surface layer of this Blasdell soil and are mostly shale. Permeability is moderately rapid in the subsoil and substratum. The available water capacity ranges from low to moderate, and runoff is medium. Bedrock is at a depth of more than 5 feet. In unlimed areas, reaction ranges from very strongly acid to medium acid in the surface layer and subsoil.

This soil is suitable for many farm and some urban uses. Most of the acreage is cultivated or is in hay or pasture. Some areas are in woodlands.

This Blasdell soil is moderately suited to most cultivated crops and well suited to hay crops. The low to moderate available water capacity and erosion hazard are the main limitations to crop growth. Surface gravel can be a problem in planting and cultivating fine-seeded crops and can cause excessive wear of machinery. Erosion is a hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues in the soil, and rotating crops increase organic matter content, which improves the available water capacity of the soil. These practices and contour tillage or stripcropping reduce the hazard of erosion. Sprinkler irrigation systems are not as well adapted to this soil as to the nearly level Blasdell soil. Most areas are well suited to pasture. Overgrazing, particularly during dry periods, can cause the loss of the pasture plants.

The potential of this soil for wood crops is fair to good. Although seedling mortality is generally not a problem, seedlings should be planted very early in the spring when the soil is moist. Brush removal and careful planting help insure seedling survival. Placing logging trails across the slope reduces trail gullying or erosion.

Slope is a minor limitation for some urban uses of this soil. Another limitation, where this soil is used for septic tank absorption fields, is the possible pollution of ground water, because the substratum is moderately rapidly permeable. Seeding lawns can be difficult because of the high content of shale fragments in this soil. Erosion is a hazard if vegetation is not reestablished on construction sites as soon as possible. Many areas are suitable for recreational uses.

This Blasdell soil is in capability subclass IIIe.

BlD—Blasdell shaly silt loam, 15 to 25 percent slopes. This moderately steep soil is deep and well drained. It formed in water-sorted deposits high in content of shaly gravel. This soil is on the sides of terraces and deltas and in hilly morainic areas where melt water left shaly deposits as it emerged from the glacial ice. Most of the shale fragments were gouged from nearby rock strata. Most areas are long and narrow or irregular in shape and range from 5 to 50 acres.

Typically, this soil has a surface layer of very friable, dark grayish brown shaly silt loam about 8 inches thick. The subsoil extends to a depth of 36 inches. It is yellowish brown very shaly silt loam in the upper part and dark yellowish brown very shaly loam in the lower part. The substratum to a depth of 60 inches or more is friable, brown very shaly loam.

Included with this soil in mapping are areas of the Farnham and Alton soils. The Farnham soils are in a few depressions along drainageways and on some toe slopes. The Alton soils are slightly less acid in the subsoil than this Blasdell soil. Also included in a few areas is a soil that is similar to this Blasdell soil but formed in firm glacial till. Included wet spots, sandy spots, gravel pits, and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

Small stones make up 15 to 35 percent of the surface layer and are mostly shale. The permeability of this Blasdell soil is moderately rapid in the subsoil and substratum. The available water capacity ranges from low to moderate, and runoff is rapid. Bedrock is at a depth of more than 5 feet. In unlimed areas, reaction ranges from very strongly acid to medium acid in the surface layer and subsoil.

This soil is poorly suited to most farm and urban uses because of the moderately steep slopes. Most of the acreage is in woodlands or is idle. Some areas are pastured.

This Blasdell soil is poorly suited to most cultivated crops because of slope and the associated erosion hazard. Additional limitations are droughtiness in midsummer and shale fragments. Shale fragments in the surface layer can be a problem in planting fine-seeded crops and cause excessive wear of machinery. Machinery is difficult to operate on slopes that are irregular or dissected. An occasional cultivated crop can be grown with a maximum of conservation practices, such as keeping tillage to a minimum, using cover crops, incorporating crop residues in the soil, tilling on the contour, stripcropping, and including sod crops in the cropping system. These practices also increase organic matter content, which improves the available water capacity of the soil. Irrigation systems are not well adapted to this moderately steep soil because of the erosion hazard.

Some areas are suitable for pasture. Overgrazing, particularly during dry periods, can cause the loss of the pasture plants and can lead to increased erosion hazard. Reseeding and applying fertilizer are somewhat difficult because of the moderately steep slopes.

The potential of this soil for wood crops is fair to good. Although seedling mortality is generally not a problem, seedlings should be planted very early in the spring when the soil is moist. Use of planting and harvesting equipment is somewhat limited because of the slope. Placing logging trails across the slope helps eliminate any hazard of trail gullying or erosion.

The moderately steep slopes are a serious limitation for most urban uses of this soil. Because erosion is a very serious hazard where vegetative cover is removed, the natural vegetation should be disturbed as little as possible during construction and areas revegetated as soon as possible. Reseeding areas can be difficult because of the high content of shale fragments and slope. Some areas are a source of shaly gravel.

This Blasdell soil is in capability subclass IVe.

BrA—Brockport silty clay loam, 0 to 3 percent slopes. This nearly level soil is somewhat poorly drained. It formed in glacial till having a high content of clay. Soft shale bedrock is at a depth of 20 to 40 inches. This soil is mostly in narrow bands on the lowland plain near Lake Erie. Individual areas range from 5 to 150 acres or more and are generally oblong.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 8 inches thick. The subsoil extends to a depth of about 23 inches. It is firm and plastic, olive brown silty clay in the upper part and firm and very plastic, dark grayish brown silty clay in the lower part. The substratum is firm, olive shaly silty clay about 8 inches thick. The underlying bedrock, at a depth of 31 inches, is calcareous shale.

Included with this soil in mapping are small areas of the deep Remsen soils and loamy Angola soils. Also included, where the underlying shale bedrock is at a depth of 40 inches or more, are small areas of Churchville and Canadice soils that have textures similar to this Brockport soil. Included wet spots, quarry pits, and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

This Brockport soil has a perched seasonal high water table in the upper part of the subsoil during December through May. Bedrock is at a depth of 20 to 40 inches. Small rock fragments range from few to 10 percent in the surface layer and are mostly shale. Rooting depth is limited by the seasonal high water table and the moderate depth to bedrock. Permeability is moderate to moderately slow in the surface layer and very slow in the subsoil. The available water capacity is moderate, and runoff is slow. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

The soil is moderately suited to farming and poorly suited to urban development. Most areas of this soil are idle, wooded, or in residential use.

If properly drained, this Brockport soil is moderately suited to cultivated crops; but without drainage, it is poorly suited to most crops. Drainage can be somewhat difficult because the subsoil is very slowly permeable and bedrock is at a moderate depth. Drains usually require close spacing to be effective. Because of the high clay content, maintaining tilth is an additional management concern. If this soil is cultivated, keeping tillage to a minimum, using cover crops, including sod crops in the cropping system, returning crop residues to the soil, and plowing at the proper moisture content are desirable for maintaining tilth and improving organic matter content. Increasing the organic matter content improves the available water capacity of the soil. Clodding and crusting of the surface is a problem in areas where tilth has deteriorated.

This soil can be used for pasture, but grazing when the soil is wet and overgrazing are the main concerns in pasture management. Grazing during wet periods causes compaction of the soil and trampling of pasture plants which can lead to reduced growth and the loss of the pasture seedings.

Potential of this soil for wood crops is fair. Seasonal wetness limits equipment use and increases seedling mortality. Because root development is limited by the seasonal high water table and depth to bedrock, uprooting of trees during windstorms is a hazard.

Moderate depth to bedrock, seasonal wetness, clayey texture, and very slow permeability in the subsoil are serious limitations for most urban uses of this soil. Foundations need special protection from seepage of water across the surface of the bedrock. Landscaping and grading minimizes problems caused by seasonal wetness. Some areas are suited to certain recreational uses, but wetness and the clayey nature of the soil restrict many recreational uses.

This Brockport soil is in capability subclass IIIw.

BrB—Brockport silty clay loam, 3 to 8 percent slopes. This gently sloping soil is somewhat poorly drained. It formed in glacial till that has a high content of clay. Soft shale bedrock is at a depth of 20 to 40 inches. This soil is on concave, mostly narrow bands on the lowland plain near Lake Erie. Individual areas range from 5 to 100 acres or more and are generally oblong.

Typically, the surface layer is dark grayish brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 23 inches. It is firm and plastic, olive brown silty clay in the upper part and firm and very plastic, dark grayish brown silty clay in the lower part. The substratum is firm, olive shaly silty clay 8 inches thick. The underlying bedrock is calcareous shale.

Included with this soil in mapping are small areas of the deep Remsen soils and loamy Angola soils. Also included, where the underlying shale bedrock is at a depth of 40 inches or more, are small areas of the somewhat poorly drained Churchville soils and the poorly drained Canadice soils that have textures similar to this Brockport soil. Included wet spots, quarry pits, and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

This Brockport soil has a perched seasonal high water table in the upper part of the subsoil from December through May. Bedrock is at a depth of 20 to 40 inches. Small rock fragments range from few to 10 percent of the surface layer and are mostly shale. Rooting depth is limited by the seasonal high water table and the moderate depth to bedrock. Permeability is moderate to moderately slow in the surface layer and very slow in the subsoil. The available water capacity is moderate, and runoff is medium. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

If drained, the soil is moderately suited to farming but poorly suited to urban uses. Most areas of this soil are idle, wooded, or in residential use.

If properly drained, this Brockport soil is moderately suited to cultivated crops; but without drainage, it is poorly suited to most crops. Drainage can be somewhat difficult because the subsoil is very slowly permeable and bedrock is at a moderate depth. Drains usually require close spacing to be effective. Interceptor drains are beneficial in many areas for diverting seepage and runoff from higher adjacent soils. Because of the high clay content of this soil, maintaining tilth is an important management concern. Clodding and crusting of the surface is a problem where tilth has deteriorated. Erosion is a hazard in intensively cultivated areas and on long slopes. If this soil is cultivated, keeping tillage to a minimum, using cover crops, tilling across slope, including sod crops in the cropping system, returning crop residues to the soil, and plowing at the proper soil moisture content help maintain tilth, control erosion, and improve the organic matter content. Increasing organic matter content improves the available water capacity of the soil.

This soil can be used for pasture, but grazing when the soil is wet and overgrazing are the main concerns in pasture management. Grazing during wet periods can cause compaction of the soil and trampling of pasture plants, which can lead to reduced growth and to the loss of the pasture seedings. If the pasture deteriorates, erosion is a hazard.

Potential of this soil for wood crops is fair. Seasonal wetness is a limitation for equipment use and increases seedling mortality. Because root development is limited by the seasonal high water table and depth to bedrock, uprooting of trees during windstorms is a hazard. Placing logging trails across the slope helps eliminate any hazard of trail gullying.

Moderate depth to bedrock, seasonal wetness, clayey texture, and very slow permeability in the subsoil are serious limitations for most urban uses of this soil. Foundations need special protection from seepage of water across the surface of the bedrock. Interceptor drains that divert runoff and seepage from higher adjacent soils can protect foundations in some areas. The landscaping and grading of sites eliminate surface ponding. This soil is difficult to recompact and regrade on construction sites because of its high clay content.

This Brockport soil is in capability subclass IIIw.

Ca—Canadice silt loam. This nearly level soil is poorly drained. It formed in glacial lake sediment that has a high content of clay. This soil is found along intermittent streams or in closed depressions on nearly flat plains. Areas of this soil generally range from 2 to 30 acres and are mostly oblong.

Typically, this soil has a surface layer of friable, dark grayish brown silt loam 8 inches thick. The subsoil is mottled, grayish brown silty clay about 45 inches thick. The substratum is firm, mottled, dark grayish brown silty clay to a depth of 65 inches or more.

Included with this soil in mapping are small areas of the Rhinebeck, Canandaigua, and Wayland soils. The Rhinebeck soils are better drained than this Canadice soil and are in slightly elevated areas. The Canandaigua soils are more silty than the Canadice soil. The Wayland soils are on dissected flood plains, and they have a lower clay content. Also included are areas of a soil that has a gravelly surface layer. Areas of included soils range from 1/4 acre to 2 acres.

In this Canadice soil the seasonal high water table is at or near the surface from December through June. The root zone is limited by the prolonged high water table. Permeability is moderate to moderately slow in the surface layer and very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. Bedrock is at a depth of more than 5 feet. The surface layer is very strongly acid to slightly acid unless limed, and the subsoil is strongly acid to mildly alkaline.

This soil is poorly suited to farming unless drained, and it is also poorly suited to most urban uses. Most areas are idle and support wetness-tolerant grasses, brush, and trees.

This Canadice soil is poorly suited to cultivated crops because it has a prolonged high water table. Drainage is often difficult because slopes are nearly flat and suitable outlets are not available. Where drainage is feasible, this soil can be fairly productive for selected crops, but maintaining tilth is a management concern. Including sod crops in the cropping system, tilling at the proper soil moisture content, using cover crops, and returning crop residues to the soil help maintain good tilth in cultivated areas.

Undrained areas can be used for pasture, but grazing during wet periods causes compaction of the soil and the trampling of grasses, which can result in the loss of the pasture seedings.

The potential of this soil for wood crops is poor. The prolonged wetness limits the use of harvesting and planting equipment and increases seedling mortality. The shallow rooting of trees caused by the prolonged high water table can result in their uprooting during windstorms.

Prolonged wetness, very slow permeability and poor stability of the soil material are very serious limitations for most urban and recreational uses of this soil. Some areas are suited to the development of wetland wildlife marshes.

This Canadice soil is in capability subclass IVw.

Cb—Canadice silt loam, shaly till substratum. This nearly level soil is deep and poorly drained. It formed in clayey glacial lake sediment that is underlain by shaly glacial till deposits at a depth of 40 to 60 inches. This soil is in nearly flat areas or in closed depressions. Slope is 0 to 3 percent. Areas of this soil generally range from 3 to 40 acres and are mostly oblong or irregular in shape.

Typically, this soil has a surface layer of friable, dark grayish brown silt loam 8 inches thick. The subsoil is mottled, grayish brown silty clay about 36 inches thick. The substratum is mottled, firm, dark grayish brown shaly silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Rhinebeck, Canandaigua, and Remson soils. The Rhinebeck soils are better drained than this Canadice soil and are in slightly elevated areas, the Canandaigua soils are more silty, and the Remson soils are somewhat poorly drained and gently sloping. Also included are areas where the surface layer is shaly and a few areas where it is mucky. In some areas, bedrock is within 5 feet of the surface. Areas of included soils range from 1/4 acre to 3 acres.

In this Canadice soil the seasonal high water table is at or near the soil surface from December through June. The root zone is limited by this prolonged high water table. Permeability is moderate to moderately slow in the surface layer and very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. Bedrock is at a depth to more than 5 feet. There is usually no gravel in the surface layer. The surface layer is very strongly acid to slightly acid, unless limed. The subsoil is strongly acid to mildly alkaline.

This soil is poorly suited to farming, unless drained. It is poorly suited to most urban uses. Most areas are idle and support wetness-tolerant grasses, brush, and trees.

This Canadice soil is poorly suited to cultivated crops because of the prolonged high water table. Drainage is often difficult because slopes are nearly flat and suitable outlets are not available. Where drainage is feasible, this soil can be fairly productive for selected crops, but maintaining tilth is a management concern. Including sod crops in the cropping system, tilling at the proper soil moisture content, using cover crops, and returning crop residues to the soil help maintain good tilth in cultivated areas. Undrained areas can be used for pasture, but grazing during wet periods causes compaction of the soil and trampling of grasses, which can result in the loss of the pasture seedings.

The potential of this soil for wood crops is poor. The prolonged wetness limits the use of harvesting and planting equipment and increases seedling mortality. The shallow rooting of trees caused by the prolonged high water table can result in their uprooting during windstorms.

Prolonged wetness, very slow permeability, and clayey texture are very serious limitations for most urban and recreation uses of this soil. This soil tends to be more stable than the Canadice soil that is not underlain by glacial till. Excavations are difficult to regrade or recompact because of the clayey texture of the soil. Some areas are suited to the development of wetland wildlife marshes.

This Canadice soil is in capability subclass IVw.

Cc—Canandaigua silt loam. This nearly level soil is deep and poorly drained. It formed in silty lake-laid sediments. This soil is on nearly flat plains or in broad, shallow depressions in the northern part of the county and is in small upland depressions in the southern part of the county. Slope ranges from 0 to 3 percent. Areas of this soil are oblong or irregular in shape and are generally 30 acres or less.

Typically, this soil has a surface layer of very friable, very dark gray silt loam 9 inches thick. The subsoil is mottled, gray to brown silt loam 28 inches thick. The substratum extends to a depth of 60 inches or more and is light brownish gray silt loam.

Included with this soil in mapping is a similar soil that has a silty clay loam surface layer and a sandy subsoil. Also included are areas of the Niagara, Lyons, and Lamson soils. The somewhat poorly drained Niagara soils are on higher benches, the Lyons soils formed in silty lake sediments underlain by loamy glacial till, and the Lamson soils have more sand in the subsoil than the Canandaigua soil. Also included are small spots of the very poorly drained Canandaigua soils that have a mucky surface layer. Areas of included soils range from 1/4 acre to 3 acres.

In this Canandaigua soil, the water table is near the surface from November through May. Some areas are ponded for brief periods. Rooting depth is limited by the prolonged high water table. Permeability is moderately slow in the subsoil and substratum. The available water capacity is high, and runoff is very slow. Reaction ranges from medium acid to mildly alkaline in the surface layer and from slightly acid to mildly alkaline in the subsoil.

This soil is moderately suited to farming if adequately drained. It is poorly suited to urban uses. Most of the acreage is idle, in pasture, or wooded. Urban development is encroaching on some areas in the suburbs of Buffalo.

Without drainage, this Canandaigua soil is poorly suited to cultivated crops. If properly drained, it is suitable for most crops grown in the region, except early- and late-season crops. Generally, some combination of open ditches and subsurface drains is desirable. Outlets for drains are difficult to locate in some areas. Where this soil is cultivated, keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling at proper soil moisture content, and rotating crops help maintain tilth and increase organic matter content.

Grazing when the soil is wet is the main concern in pasture management. Grazing during wet periods causes compaction of the soil and trampling of grasses, which can lead to the deterioration of the pasture.

The potential of this soil for wood crops is fair to poor. The prolonged high water table severely limits the use of equipment and increases seedling mortality. The shallow rooting depth causes trees to be uprooted during windstorms. Seedling species that can withstand prolonged wet periods are desirable.

The prolonged high water table is a serious limitation for most urban uses. Stability of the soil is also a problem for some uses. Many areas are suitable for the development of habitat for wetland or woodland wildlife.

This Canandaigua soil is in capability subclass IIIw.

Cd—Canandaigua mucky silt loam. This level soil is deep and very poorly drained. It formed in silty lake-laid sediments that have accumulated organic matter on the surface. This soil is in depressional areas that are usually ponded until late spring. Slope ranges from 0 to 2 percent. Areas of this soil are roughly circular and range from 5 to 30 acres.

Typically, this soil has a surface layer of friable, black mucky silt loam about 9 inches thick. The subsoil is mottled, gray to brown silt loam about 28 inches thick. The substratum is firm, light brownish gray silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Lamson soils that have a mucky, very fine sandy loam surface layer. Pockets of Palms muck are in a few small areas. Also included are some areas of a soil that does not have a mucky surface layer. Areas of included soils are 1/4 acre to 2 acres.

In this Canandaigua soil, a high water table is at or near the surface from November through May, and most areas are ponded in the spring. Rooting depth is limited by the prolonged high water table. Permeability is moderately slow in the subsoil and substratum. The available water capacity is high, and runoff is ponded. This soil ranges from medium acid to mildly alkaline in the surface layer and from slightly acid to mildly alkaline in the subsoil.

This soil is poorly suited for farming, unless drained. It is unsuited for most urban and recreational uses. Most of the acreage is idle or in woodland.

Without artificial drainage, this Canandaigua soil is not suited to cultivated crops. If properly drained, it is suited to many crops grown in the area, except early-market and late-season crops. The main limitation to drainage is the lack of adequate outlets. Where adequate outlets can be established, standard management for crops includes keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops. These practices help maintain tilth and increase the high organic matter content of the soil. Partial drainage is desirable if this soil is used for pasture. Grazing when the soil is wet causes compaction and trampling of pasture grasses and leads to poor growth.

The potential of this soil for wood crops is poor. The shallow rooting depth that results from the prolonged high water table causes the uprooting of trees during windstorms. The prolonged wetness also limits the use of equipment and increases seedling mortality.

Ponding in the spring, the prolonged high water table, moderately slow permeability in the subsoil, and the high amount of humus in the surface layer are very serious limitations for most urban uses of this soil. Some areas are well suited to the development of wetland wildlife habitat.

This Canandaigua soil is in capability subclass IVw.

CeA—Castile gravelly loam, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It is on elongated terraces of outwash and deltaic deposits. Areas of this soil range from 3 to 50 acres or more, but most areas are 20 acres or less.

Typically, this soil has a surface layer of very dark grayish brown gravelly loam about 8 inches thick. The upper part of the subsoil is dark brown gravelly loam about 11 inches thick. The lower part of the subsoil is mottled, dark yellowish brown very gravelly loam about 12 inches thick. The substratum is brown very gravelly sandy loam to a depth of 65 inches or more.

Included with this soil in mapping are small areas of the well drained Chenango soils, areas of a soil that has cobblestones in the surface layer, and a few spots of the gently sloping Castile soils. Also included are small areas of the somewhat poorly drained Red Hook soils on foot slopes and along drainageways and a few areas of the Varysburg soils that are underlain by sediment high in silt and clay. Other included small areas are more sandy and have less small stones than is typical for the Castile soils. Included areas range from 1/2 acre to 2 acres.

Gravel makes up 15 to 35 percent of the surface layer of this Castile soil. In the spring the seasonal high water table is in the lower part of the subsoil. Permeability is moderately rapid in the subsoil and rapid or very rapid in the substratum. The available water capacity is moderate to low, and runoff is slow. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suitable for farming and moderately suitable for many urban uses. Most of the acreage is cultivated, in pasture, or in woodland.

Although this Castile soil is suited to cultivated crops, seasonal wetness can briefly delay tillage in the spring. Erosion is not a problem on this nearly level soil, except where open ditches are not protected with vegetative cover. Gravel in the surface layer accelerates equipment wear and is bothersome in planting fine-seeded crops. Keeping tillage to a minimum, using cover crops, including grasses and legumes in the cropping system, and returning crop residues to the soil help maintain tilth and increase organic matter content. Because this soil tends to be droughty in midsummer, it is important to increase the organic matter content, which improves the available water capacity of the soil. Drainage of wet spots allows for better use of some fields.

This soil is well suited to pasture. Restricting grazing in the spring when the soil is wet and not overgrazing in midsummer when it is dry help maintain good quality pasture.

The potential of this soil for wood crops is good. There are few limitations for the use of equipment, and erosion is not a hazard. Although seedling mortality is low, seedlings should be planted early in the spring when the soil is moist.

Temporary seasonal wetness is the main limitation for urban and recreational uses. If the soil is used for septic tank absorption fields contamination of the ground water is a hazard. because the substratum is rapidly or very rapidly permeable. Drainage around foundations minimizes the problem of seasonal wetness. Lawns need irrigation in midsummer because the soil tends to be droughty in dry periods. This soil is a potential source of sand and gravel.

This Castile soil is in capability subclass IIw.

CeB—Castile gravelly loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It is on elongated terraces, remnant beach ridges, and undulating deltas. This soil has a high content of sand and gravel. Areas of this soil range from 3 to 50 acres or more, but most areas are 20 acres or less.

Typically, this soil has a surface layer of very dark grayish brown gravelly loam about 8 inches thick. The upper part of the subsoil is dark brown gravelly loam about 11 inches thick, and the lower part is mottled, dark yellowish brown very gravelly loam about 12 inches thick. The substratum is brown very gravelly sandy loam to a depth of 65 inches or more.

Included with this soil in mapping are small areas of the well drained Chenango soils, areas where cobblestones are in the surface layer, and a few spots of the nearly level Castile soils. Also included are small areas of the somewhat poorly drained Red Hook soils on foot slopes and along drainageways and areas of the Varysburg soils that are underlain by sediment high in silt and clay. Other included small areas are more sandy and have fewer small stones than is typical of the Castile soils. Included areas range from 1/2 acre to 2 acres.

Gravel makes up 15 to 35 percent of the surface layer. In the spring this Castile soil has a seasonal high water table in the lower part of the subsoil. Permeability is moderately rapid in the subsoil and rapid or very rapid in the substratum. The available water capacity is moderate to low, and runoff is slow. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suitable for farming and moderately suitable for many urban uses. Most of the acreage is cultivated, pastured, or in woodland.

Although this Castile soil is suited to cultivated crops, seasonal wetness can briefly delay tillage in the spring. Erosion is a slight problem on this gently sloping soil, particularly in intensively cultivated areas. Gravel in the surface layer accelerates equipment wear and is bothersome in planting fine-seeded crops. Keeping tillage to a minimum, using cover crops, including grasses and legumes in the cropping system, tilling on the contour, and returning crop residues to the soil help maintain tilth, control erosion, and increase organic matter content. Because this soil tends to be droughty in midsummer, it is important to increase the organic matter content, which improves the available water capacity of the soil. Drainage of wet spots allows for better use of some fields.

This soil is well suited to pasture. Restricting grazing in the spring when the soil is wet and not overgrazing in midsummer when it is dry help maintain good quality pasture.

The potential of this soil for wood crops is good. There are few limitations to the use of equipment, and erosion is not a hazard. Although seedling mortality is low, seedlings should be planted early in the spring when the soil is moist.

Temporary seasonal wetness is the main limitation for urban and recreational uses. If the soil is used for septic tank absorption fields, contamination of the ground water is a hazard because the substratum is rapidly or very rapidly permeable. Drainage around foundations minimizes the problem of seasonal wetness. Drains are somewhat easier to install in this soil than in the nearly level Castile soils. Lawns need irrigation in midsummer because the soil tends to be droughty in dry periods. This soil is a potential source of sand and gravel.

This Castile soil is in capability subclass IIw.

CfB—Cayuga silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained to moderately well drained. It formed in clay-rich lake-laid sediments underlain by glacial till at a depth of 20 to 40 inches. This Cayuga soil is on broad lowland plains in the northern part of the county. Areas of this soil are irregular in shape and range from 5 to 100 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam about 8 inches thick. The subsurface layer is mottled, brown heavy silt loam about 2 inches thick. The subsoil is about 16 inches thick. It is mottled, brown heavy silt clay loam in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches or more is mottled, reddish brown gravelly loam.

Included with this soil in mapping are small intermingled areas of the Churchville, Schoharie, Rhinebeck, Collamer, and Niagara soils. The somewhat poorly drained Churchville soils are on concave foot slopes and along drainageways, the Schoharie and Rhinebeck soils formed in clayey deposits that are more than 40 inches thick, and the Collamer and Niagara soils have a lower clay content than the Cayuga soil. Areas of included soils range up to 3 acres in size.

In April and May this Cayuga soil has a perched seasonal high water table in the lower part of the subsoil for brief periods. Permeability and internal drainage are slow. The available water capacity is moderate to high, and runoff is medium. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is suited to farming but has limitations for most urban uses. Most of the acreage is in cultivated crops, hay, or pasture or is idle. Some areas are urbanized, and a few areas are in woodland.

The Cayuga soil is suited to cultivated crops, but temporary wetness in some areas can delay planting in the spring. Drainage of spots of included wet soils makes the use of fields more efficient. Erosion is a hazard, particularly on long slopes and where vegetative cover has been removed. Maintaining good tilth is important because of the high clay content of the soil. If tilth deteriorates, crusting and clodding can result, internal drainage is impeded, and seed germination and root growth are reduced. Keeping tillage to a minimum, tilling on the contour, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and including sod crops in the cropping system minimize the hazard of erosion and help maintain good tilth.

This soil is well suited to pasture and hay. Grazing should be avoided during wet periods to prevent compaction and puddling of the soil and trampling of pasture plants. Restricted grazing during these periods helps insure good growth and reduces the risk of seedling loss.

The potential of this soil for wood crops is good. Seedling mortality is generally not a problem, but seedlings should be planted early in the spring when the soil is moist. Erosion is usually not a hazard, but skid trails placed across the slope reduce trail gullying.

The temporary seasonal high water table, slow permeability in the subsoil and substratum, and the high clay content of the subsoil are limitations for urban uses of this soil. Drains around foundations help remove excess water during wet periods. If the clayey subsoil is disturbed during construction, it is difficult to recompact and settlement is usually uneven. Erosion and mud flows are serious problems when the subsoil is exposed at development sites. Some areas are good sites for selected recreational uses.

This Cayuga soil is in capability subclass IIe.

CfC—Cayuga silt loam, 8 to 15 percent slopes. This sloping soil is deep and well drained to moderately well drained. It formed in clay-rich lake-laid sediments underlain by glacial till at a depth of 20 to 40 inches. This Cayuga soil is on ridges and knolls and on the sides of dissected drainageways on lowland plains in the northern part of the county, and it is on some valley sides in the southern part of the county. Areas of this soil are mostly oblong and range from 5 to 50 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam about 8 inches thick. The subsurface layer is mottled, brown heavy silt loam about 2 inches thick. The subsoil is about 16 inches thick. It is mottled, brown heavy silty clay loam in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches or more is mottled, reddish brown gravelly loam.

Included with this soil in mapping are small intermingled areas of the Churchville, Hudson, Schoharie, and Collamer soils. The somewhat poorly drained Churchville soils are on concave foot slopes and along drainageways, the Hudson and Schoharie soils formed in clayey deposits that are more than 40 inches thick, and the Collamer soils are more silty and have a lower clay content than this Cayuga soil. Areas of included soils range up to 3 acres.

In April and May this Cayuga soil has a perched seasonal high water table in the lower part of the subsoil for brief periods. Permeability and internal drainage are slow. The available water capacity is moderate to high, and runoff is rapid. Depth to bedrock is more than 5 feet. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

This soil is moderately suited to farming but has limitations for most urban uses. Most of the acreage is in hay or pasture or is idle. Some areas are urbanized, and a few areas are in woodland.

The Cayuga soil is moderately suited to cultivated crops, but the erosion hazard and temporary wetness in the spring are limitations. Drainage of spots of included wet soils makes the use of many fields more efficient. Erosion is a serious hazard, particularly on long slopes and where the soil is intensively cultivated. Maintaining good tilth is difficult because of the high clay content of the soil. If tilth deteriorates, crusting and clodding can result, internal drainage is impeded, and seed germination and root growth are reduced. Keeping tillage to a minimum, tilling on the contour, using cover crops, incorporating crop residues into the soil, stripcropping, plowing at the proper soil moisture content, and including sod crops in the cropping system reduce the hazard of erosion and help maintain good tilth.

This soil is well suited to pasture and hay. Grazing should be avoided when the soil is wet to prevent compaction and puddling of the soil and trampling of pasture plants. Restricted grazing during these periods helps insure good growth and reduces the risk of seeding loss.

The potential of this soil for wood crops is good. Seedling mortality is generally not a problem, but seedlings should be planted early in the spring when the soil is moist. Erosion is usually not a hazard, but placing skid trails across the slope reduces the chances of trail gullying and erosion.

The temporary seasonal high water table, slope, slow permeability in the subsoil and substratum, and the high clay content of the subsoil are limitations for urban uses of this soil. Drains around foundations and interceptor drains help remove excess water during wet periods. If the clayey subsoil is disturbed during construction, it is difficult to recompact and settlement is usually uneven. Erosion and mud flows are serious problems when the subsoil is exposed on construction sites. Revegetating these sites as soon as possible reduces the erosion hazard.

This Cayuga soil is in capability subclass IIIe.

CgB—Cazenovia silt loam, 3 to 8 percent slopes. This gently sloping soil is well drained and moderately well drained. It formed in glacial till deposits on the higher parts of the lowland till plains and on convex tops of some ridges. Areas of this soil are irregular in shape on till plains and elongated in a southwest-northeast direction on ridges. Areas range from 3 to 100 acres or more, but areas of 5 to 40 acres are most common.

Typically, this soil has a surface layer of dark brown silt loam about 9 inches thick that is underlain by a leached layer of pinkish gray silt loam about 2 inches thick. The subsoil is about 21 inches thick. It is reddish brown silty clay loam that is friable in the upper part and firm in the lower part. The substratum is reddish brown gravelly silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Ovid, Churchville, and Honeoye soils. The somewhat poorly drained Ovid soils are in depressional areas and along some drainageways. The Churchville soils are in nearly flat areas. They formed in deposits of shallow, clayey, lake sediment. The well drained Honeoye soils contain less clay than this Cazenovia soil and are on a few rises or knolls. Also included are small areas where stone-free sandy loam layers are 20 inches or less thick over glacial till. These areas have been identified with a special symbol on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

In the spring and during other wet periods, a perched seasonal high water table is in the lower part of the subsoil of this Cazenovia soil for brief periods. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is medium. Bedrock is at a depth of more than 5 feet. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

This soil is suitable for farming but has some limitations for urban development. Most areas are farmed or used for urban development.

This Cazenovia soil is well suited to most crops common to the region. After a rain, it remains wet for a short period. If tilled when too wet, this soil is likely to puddle and then to crust as it dries. Erosion is a hazard, particularly where slopes are long. Keeping tillage to a minimum, cultivating at timely intervals, using cover crops, including grasses and legumes in the cropping system, and tilling across slopes help control erosion and maintain tilth. With adequate drainage of wet spots and maintenance of tilth and fertility levels, this soil can be productive for most crops.

This soil is also suited to pasture. Overgrazing and grazing when the soil is wet are the major concerns of pasture management. Rotational grazing and restricted grazing during wet periods help maintain a productive pasture.

The potential of this soil for wood crops is good. There are few limitations for equipment use, and seedling mortality is low. Erosion is generally not a problem. Placing logging trails on the contour minimizes the hazard of trail gullying.

Temporary seasonal wetness, slow permeability in the substratum, and potential frost action damage are limitations for many urban uses of this soil. Interceptor drains placed upslope and proper grading of the soil minimize the seasonal wetness around foundations. Heaving resulting from frost action is a threat to shallow foundations and streets. Because the substratum is slowly permeable, some areas are good sites for ponds.

This Cazenovia soil is in capability subclass IIe.

CgC—Cazenovia silt loam, 8 to 15 percent slopes. This sloping soil is well drained and moderately well drained. It formed in glacial till deposits on sides of knolls and subdued drumlin-type ridges on the lowland till plain. Areas of this soil are elongated and have smooth, convex slopes 100 to 200 feet long. They range from 3 to 30 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of dark brown silt loam about 9 inches thick, underlain by a subsurface layer of pinkish gray silt loam about 2 inches thick. The subsoil is about 21 inches thick. It is reddish brown silty clay loam that is friable in the upper part and firm in the lower part. The substratum is reddish brown gravelly silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Ovid, Churchville, and Honeoye soils. The somewhat poorly drained Ovid soils are in a few low areas and along some drainageways. The Churchville soils formed in deposits of shallow, clayey, lake sediment. The well drained Honeoye soils contain less clay than this Cazenovia soil and are sometimes on the highest parts of the landscape. Also included are small areas of sandy deposits underlain by glacial till. These areas are identified by a sand spot symbol on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

In the spring and during other wet periods, a perched seasonal high water table is in the lower part of the subsoil of this Cazenovia soil.

Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is medium to rapid. Bedrock is at a depth of more than 5 feet. Reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

This soil is moderately suited to farming but has limitations for most urban and recreational uses. Many areas are used as pasture and hayland, some are cultivated or in residential development, and a few are idle or wooded.

This Cazenovia soil is moderately suited to cultivated crops, but erosion is a serious hazard, especially where it is intensively cultivated. Temporary wetness of the soil in the spring can delay early tillage and planting. If the soil is tilled when it is too wet, it can puddle and then crust or become cloddy. Keeping tillage to a minimum, stripcropping, tilling on the contour, including sod crops in the cropping system, and using cover crops minimize the erosion hazard and help maintain good tilth.

This soil is well suited to hay and pasture. Many areas are better suited to these crops than to row crops.

Overgrazing and grazing when the soil is wet are major concerns of pasture management. Rotational grazing and restricted grazing during wet periods help maintain high quality pasture.

The potential of this soil for wood crops is good. Seedling mortality is generally not a problem, but planting early in the spring when the soil is moist helps insure seedling survival. Placing logging trails across the slope reduces the hazards of trail gullying and erosion.

Slope, slow permeability in the subsoil, temporary seasonal wetness, and the possibility of frost heave are limitations for urban uses of this soil. Interceptor drains help divert runoff and subsurface seepage from foundations and septic tank absorption fields. The slow movement of water through the soil is a limitation if the soil is used for septic tank absorption fields. The surface soil is suitable for lawns and fairways. Frost action is a threat to shallow foundations and streets. Although slope is a limitation, some areas are suitable for selected recreational uses.

This Cazenovia soil is in capability subclass IIIe.

Ch—Cheektowaga fine sandy loam. This is a level to nearly level, poorly drained and very poorly drained soil that formed in sandy sediments underlain by sediments high in clay content. The sandy mantle is 20 to 40 inches deep. This soil is in depressional areas on lake plains. Slope is 0 to 3 percent. Areas of this soil are irregular in shape and range from 5 to 150 acres or more. The larger areas generally are in the northern part of the county, but areas in the southern part are scattered and smaller.

Typically, this soil has a surface layer of black fine sandy loam 9 inches thick. The subsurface layer is mottled, gray loamy fine sand 6 inches thick. The subsoil is mottled, grayish brown and brown loamy fine sand about 11 inches thick. The upper part of the substratum is mottled, dark brown varved silty clay loam, and the lower part is mottled, reddish brown varved silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas that have a mucky very fine sandy loam surface layer resulting from large deposits of organic matter. Other major inclusions are areas where the sandy mantle is less than 20 inches thick or more than 40 inches thick. The somewhat poorly drained Cosad soils are included on a few higher benches and rises. Areas of included soils range from 1/4 acre to 3 acres.

In this Cheektowaga soil a perched water table is at or near the surface from November through June. It severely limits the rooting of many plants. Permeability is rapid in the upper sandy mantle and slow or very slow in the clayey substratum. The available water capacity is moderate, and runoff is slow. There is usually no gravel, and bedrock is at a depth of more than 5 feet. The surface layer and upper part of the subsoil are medium acid to neutral.

This soil is poorly suited to farming, unless drained. Limitations for urban uses are very serious. This soil is used for pasture, hay, or woodland. In a few drained areas it is used for truck crops and urban development. Large areas are idle.

If properly drained, this Cheektowaga soil is suited to many crops and row crops can be grown intensively. The response to tile drainage is excellent, but outlets are not always available. Using cover crops, keeping tillage to a minimum, and returning all crop residues to the soil help maintain the organic matter content and a friable surface layer. Where subsurface drains are installed, special filters or wrapping of joints may be needed to prevent the tile from plugging up with fine sand and silt.

In partially drained areas, this soil can support wetness-tolerant pasture grasses. Grazing when the soil is wet causes soil compaction and trampling of plants, which leads to restricted growth. Restricting grazing when the soil is wet helps insure good quality pasture.

The potential of this soil for wood crops is poor. Seedling varieties that can withstand excessive soil wetness are desirable; however, seedling mortality is usually high. Uprooting of trees during windstorms is a hazard because of the shallow rooting depth caused by the prolonged high water table.

The prolonged high water table and slow or very slow permeability in the substratum are serious limitations for most urban and recreational uses of this soil. Cuts or excavations tend to be unstable and erodible. Most areas are difficult to drain because of the low position of this soil on the landscape. Some areas are well suited to the development of wetland wildlife habitat.

This Cheektowaga soil is in capability subclass IVw.

CkA—Chenango gravelly loam, 0 to 3 percent slopes. This level to nearly level soil is deep and well drained to somewhat excessively drained. Individual areas of this soil are elongated on terraces and beach ridges and irregular in shape on outwash plains and deltas. They range from 3 to 50 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of dark brown gravelly loam about 8 inches thick. The subsoil extends to a depth of about 30 inches. The upper part of the subsoil is yellowish brown gravelly loam about 5 inches thick. The lower part is dark brown very gravelly loam. The substratum to a depth of 60 inches or more is very friable, dark brown and light brownish gray very gravelly loamy sand.

Included with this soil in mapping are small areas where the surface layer is cobbly loam and areas of gently sloping Chenango soils. Also included are small spots of the moderately well drained Castile soils and of the well drained Allard soils. The Allard soils have a silty mantle. Areas of the included soils are 1/4 to 2 acres.

The permeability of this Chenango soil is moderate or moderately rapid in the subsoil and rapid in the substratum. The available water capacity is low to moderate, and runoff is slow. Gravel makes up 15 to 30 percent of the surface layer. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from strongly acid to very strongly acid in the surface layer and very strongly acid to medium acid in the subsoil.

This soil is suited to farming. It has few limitations for urban uses. Most of the acreage is in field crops or in vegetable crops. A few areas are urbanized.

This Chenango soil is well suited to cultivated crops and early-season vegetable crops. Droughtiness and occasional cobblestones are the main limitations. Gravel and small rock fragments can interfere with planting some fine-seeded crops and increase the rate of wear of machinery. Minimum tillage, using cover crops, incorporating crop residues into the soil, and rotating crops improve tilth and maintain organic matter content. Increasing the organic matter content improves the available water capacity of the soil. Crops respond well to liming and irrigation. Sprinkler irrigation systems are somewhat easier to manage on this soil than on the more sloping Chenango soils.

The potential of this soil for wood crops is good. Seedling mortality is slight, but seedlings should be planted in the spring when the soil is moist.

This soil has few limitations for urban use. Where this soil is used for septic tank absorption fields, contamination of ground water is possible because the substratum is rapidly permeable. Frequent fertilization and watering between summer rains help maintain high quality grass and shrubs. Gravel is bothersome in establishing lawns. This soil is a good source of sand and gravel. Some areas provide suitably level sites for recreational uses.

This Chenango soil is in capability subclass IIs.

CkB—Chenango gravelly loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained to somewhat excessively drained. It is on outwash plains, beach ridges, terraces, and deltas. Individual areas are irregular in shape on outwash plains, elongated on beaches, and oval on terraces and deltas. They range from 3 to 100 acres, but areas of 5 to 25 acres are most common.

Typically, this soil has a surface layer of dark brown gravelly loam about 8 inches thick. The subsoil extends to a depth of about 30 inches. The upper part of the subsoil is yellowish brown gravelly loam about 5 inches thick. The lower part is dark brown very gravelly loam. The substratum is very friable, dark brown and light brownish gray very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of nearly level Chenango soils and areas of Castile, Allard, and Alton soils. The Castile soils are similar to Chenango soils but are moderately well drained. The Allard soils have a silty mantle. The Alton soils are not as acid as the Chenango soils. The included soils occupy areas up to 2 acres.

The permeability of this Chenango soil is moderate or moderately rapid in the subsoil and rapid in the substratum. The available water capacity is low to moderate, and runoff is slow. Gravel makes up 15 to 30 percent of the surface layer. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from strongly acid to very strongly acid in the surface layer and from very strongly acid to medium acid in the subsoil.

This soil is suited to farming and has few limitations for urban uses. Most of the acreage is in field crops or vegetable crops.

This Chenango soil is suited to cultivated crops and early-season vegetable crops. Droughtiness and occasional surface stones and gravel are the main limitations. The hazard of erosion is a slight problem in some areas. Gravel and occasional cobblestones interfere with planting some crops and cause more rapid wear of machinery. Keeping tillage to a minimum, using cover crops, tilling on the contour where practical, incorporating crop residues into the soil, and rotating crops improve tilth and minimize the erosion hazard. These practices also increase the organic matter content, which improves the available water capacity of the soil. Crops respond well to liming and irrigation. Irrigation is slightly more difficult on this soil than on the nearly level Chenango soil.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Seedling mortality is slight, but seedlings should be planted early in the spring when the soil is moist. Erosion and the uprooting of trees during windy periods are generally not problems.

This soil has few limitations for urban use. Where this soil is used for septic tank absorption fields, contamination of ground water is possible because the substratum is rapidly permeable. Frequent fertilization and watering between summer rains help maintain grass and shrubs. This soil is a good source of sand and gravel. Grading of sites for construction purposes is somewhat more difficult on this soil than it is on the nearly level Chenango soils.

This Chenango soil is in capability subclass IIs.

CkC—Chenango gravelly loam, 8 to 15 percent slopes. This sloping soil is deep and well drained to somewhat excessively drained. It is on rolling outwash plains, remnant beach ridges, and terraces. Individual areas are irregular in shape on outwash plains and elongated on beaches and terrace fronts. They range from 3 to 50 acres, but areas of 5 to 25 acres are most common.

Typically, this soil has a surface layer of dark brown gravelly loam about 8 inches thick. The subsoil extends to a depth of about 30 inches. The upper part of the subsoil is yellowish brown gravelly loam about 5 inches thick, and the lower part is dark brown very gravelly loam. The substratum is very friable, dark brown and light brownish gray very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the gently sloping Chenango soils and areas of Castile and Alton soils. The Castile soils are similar to the Chenango soils but are moderately well drained. Alton soils are not as acid as the Chenango soils and have a cobbly surface layer in places. The included soils occupy areas up to 2 acres.

The permeability of this Chenango soil is moderate or moderately rapid in the subsoil and rapid in the substratum. The available water capacity is low to moderate, and runoff is medium. Gravel makes up 15 to 30 percent of the surface layer. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from strongly acid to very strongly acid in the surface layer and from very strongly acid to medium acid in the subsoil.

This soil is moderately suited to farming. It has some limitations for urban uses. Most of the acreage is in hay or pasture. Some areas are idle or wooded, and a few areas are used for residential development.

This Chenango soil is moderately suited to cultivated crops. Slope, erosion hazard, droughtiness, and occasional surface stones and gravel are the main limitations. The hazard of erosion is serious in intensively cultivated areas. Gravel and occasional cobblestones interfere with planting some crops and cause more wear of machinery. Keeping tillage to a minimum, using cover crops, tilling on the contour where practical, incorporating crop residues into the soil, and growing sod crops improve tilth and minimize the erosion hazard. These practices also increase the organic matter content, which improves the available water capacity of the soil. Crops respond well to liming and irrigation. Irrigation is more difficult on this soil than on the less sloping Chenango soils. Most areas are suited to hay and pasture. Overgrazing during dry periods can cause loss of desirable pasture plants.

The potential of this soil for wood crops is good. Seedling mortality is slight, but seedlings should be planted early in spring when the soil is moist. Erosion and the uprooting of trees during windy periods are generally not problems.

This soil has some limitations for urban use. Slope is the main limitation. Where this soil is used for septic tank absorption fields, contamination of ground water is possible because of the rapid permeability of the substratum. Frequent fertilization and watering between summer rains help maintain grass and shrubs. This soil is a good source of sand and gravel. During construction, grading should be kept to a minimum and the revegetation reestablished as soon as possible to minimize the erosion hazard.

This Chenango soil is in capability subclass IIIe.

CkD—Chenango gravelly loam, 15 to 25 percent slopes. This moderately steep soil is deep and well drained to somewhat excessively drained. It is in hilly outwash areas and on terrace fronts and dissected deltas. Individual areas are irregular in shape in hilly outwash areas and elongated on terraces and deltas. They range from 3 to 50 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark brown gravelly loam about 8 inches thick. The subsoil extends to a depth of about 30 inches. The upper part of the subsoil is yellowish brown gravelly loam about 5 inches thick, and the lower part is dark brown very gravelly loam. The substratum is very friable, dark brown and light brownish gray very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of gently sloping and sloping Chenango soils and areas of Castile, Palmyra, and Alton soils. The Castile soils are similar to the Chenango soils but are moderately well drained. The Palmyra soils have a higher clay content in the subsoil than the Chenango soils. The Alton soils are not as acid as the Chenango soils. Some areas have a cobbly surface layer. The included soils occupy areas up to 3 acres.

The permeability of this Chenango soil is moderate or moderately rapid in the subsoil and rapid in the substratum. The available water capacity is low to moderate, and runoff is medium to rapid. Gravel makes up 15 to 30 percent of the surface layer. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from strongly acid to very strongly acid in the surface layer and from very strongly acid to medium acid in the subsoil.

This soil is poorly suited to farming, and it has serious limitations for urban uses. Most of the acreage is in pasture or woodland. Some areas are idle.

This Chenango soil is poorly suited to cultivated crops. Slope, erosion hazard, and droughtiness are the main limitations. The hazard of erosion is very serious in cultivated areas. Cultivated crops can occasionally be grown if a maximum use is made of conservation practices. The operation of equipment on this soil is very difficult because of the slope. Hay crops can be grown, but harvesting is somewhat difficult. This soil is suited to pasture, but overgrazing when the soil is dry can cause loss of the pasture seeding and increase the erosion hazard.

The potential of this soil for wood crops is good, but harvesting may be somewhat difficult because of the moderately steep slopes. Placing logging trails on the contour where practical reduces the hazard of trail gullying.

This soil has serious limitations for urban use because of the moderately steep slopes. Where this soil is used for septic tank absorption fields, contamination of ground water is possible because of the rapid permeability of the substratum. Frequent fertilization and watering between summer rains help maintain grass and shrubs. This soil is a good source of sand and gravel. During construction, grading should be kept to a minimum and the vegetation reestablished as soon as possible to minimize the erosion hazard.

This Chenango soil is in capability subclass IVe.

ClA—Chenango channery silt loam, fan, 0 to 3 percent slopes. This nearly level soil is deep and well drained. It is on alluvial fans and remnant deltas. Areas of this soil are typically triangular or fan shaped. They range from 3 to 30 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of about 32 inches. It is yellowish brown channery loam in the upper part and dark brown very channery loam in the lower part. The substratum is dark brown and light brownish gray very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of gently sloping Chenango soils. Also included are a few areas of the moderately well drained Farnham soils that have a high shale content. A few spots have a gravelly surface layer. Included areas range up to 3 acres.

This Chenango soil is subject to rare flooding; however, in areas adjacent to low bottom land, more frequent flooding is possible. Early in the spring water movement through the soil is common at depths of 3 to 6 feet. The permeability of this soil is moderate to moderately rapid in the subsoil and rapid in the substratum. The available water capacity is low to moderate, and runoff is slow. Channery fragments make up 15 to 30 percent of the surface layer. In unlimed areas, the surface layer is strongly acid or very strongly acid and the subsoil is very strongly acid to medium acid.

This soil is suitable for farming. It has limitations for most urban uses. Most of the acreage is in field crops or vegetable crops.

This Chenango soil is well suited to cultivated crops and some vegetable crops. Rare flooding, droughtiness, and small stones are the main limitations for crop production. Flooding is rare, and it usually occurs early in spring before crops are planted. Channery fragments and occasional flagstones interfere with planting and harvesting some crops and cause excessive wear of machinery. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and rotating crops help maintain tilth and improve organic matter content. These practices also improve the available water capacity of the soil and reduce the hazard of scour during periods of flooding. Crops respond well to irrigation and liming. Sprinkler irrigation systems on this nearly level soil are easier to operate and manage than on the more sloping Chenango soils.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Seedling mortality is generally not a problem, but seedlings should be planted early in the spring when the soil is moist. Erosion is usually not a hazard, but scour that results from flooding can be a hazard.

This soil is limited for many urban uses by the hazard of rare flooding, seepage, and a high water table in the substratum early in spring. Where this soil is used for septic tank absorption fields, contamination of ground water is possible because of the rapid permeability of the substratum. The lateral movement of water through the substratum early in spring is a problem for basements and other uses that require excavation. This soil is a good source of roadfill. Many areas are suitable for uses that require a level site but are not restricted because of occasional flooding and small stones.

This Chenango soil is in capability subclass IIs.

CIB—Chenango channery silt loam, fan, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on alluvial fans and remnant deltas. Areas are typically triangular or fan shaped. These areas are usually along valley floors where side streams enter the main valley. They range from 3 to 30 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of about 32 inches. It is yellowish brown channery loam in the upper part and dark brown very channery loam in the lower part. The substratum is dark brown and light brownish gray very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of nearly level Chenango soils. Also included are a few areas of the moderately well drained Farnham soils that have a high shale content and a few spots where the surface layer is gravelly. Included areas range up to 3 acres.

This Chenango soil is subject to rare flooding from side streams that enter main valleys; however, in areas adjacent to low bottom land, more frequent flooding is common. Early in the spring water movement through the soil is common at depths of 3 to 6 feet. The permeability of this soil is moderate to moderately rapid in the subsoil and rapid in the substratum. The available water capacity is low to moderate, and runoff is slow to medium. Channery fragments make up 15 to 30 percent of the surface layer. Bedrock is at a depth of 5 feet or more. In unlimed areas, the surface layer is strongly acid or very strongly acid and the subsoil is very strongly acid to medium acid.

The soil is suitable for farming. It has limitations for most urban uses. Most of the acreage is in field crops or in vegetable crops.

This Chenango soil is well suited to cultivated crops and some vegetable crops. Rare flooding, the erosion hazard, droughtiness, and small stones are the main limitations for crop production. Flooding is rare, and it usually occurs early in spring before crops are planted. Erosion can be a hazard on long slopes and in intensively cultivated areas. Channery fragments and occasional flagstones interfere with planting and harvesting some crops and cause excessive wear of machinery. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, and rotating crops help maintain tilth and control erosion. These practices also reduce the hazard of scour during flooding and improve the organic matter content, which improves the available water capacity of the soil. Crops on this soil respond well to irrigation and liming. Sprinkler irrigation systems on this gently sloping soil are easier to operate and manage than on the steep Chenango soils. This soil is also well suited to pasture. Droughtiness in midsummer somewhat restricts the growth of forage plants.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Seedling mortality is generally not a problem, but seedlings should be planted early in spring when the soil is moist. Erosion is usually not a hazard, but scour that results from flooding can be a hazard.

This soil has limitations for many urban uses because of the hazard of rare flooding, seepage, and the high water table in the substratum early in the spring. Where this soil is used for septic tank absorption fields, contamination of ground water is possible because of the rapid permeability of the substratum. Lateral movement of water through the substratum early in the spring is a problem for basements and other uses that require excavation. Liberal applications of lime and fertilizer are beneficial for maintaining and establishing lawns. This soil is usually a good source of roadfill.

This Chenango soil is in capability subclass IIs.

CmE—Chenango and Palmyra soils, 25 to 40 percent slopes. This map unit consists of deep, steep, somewhat excessively drained to well drained soils that formed in glacial outwash deposits. These soils are on terrace fronts, ridge sides, and side slopes of dissected outwash plains. Chenango soils formed in gravelly and sandy deposits derived from sandstone and siltstone; whereas Palmyra soils formed in similar deposits that have a higher component of limestone. Chenango soils have a lower clay content and are more acid than Palmyra soils. The surface layer is gravelly loam, gravelly silt loam, or gravelly sandy loam. Areas are long and mostly narrow. They range from 3 to 50 acres, but areas of 5 to 20 acres are most common. Areas consist of either Chenango soils or Palmyra soils or both. In areas where both soils occur, the Chenango soils make up about 50 percent of the map unit and the Palmyra soils about 35 percent.

Typically, the Chenango soil has a surface layer of dark brown gravelly loam about 8 inches thick. The subsoil extends to a depth of 30 inches. It is yellowish brown gravelly loam in the upper part and dark brown very gravelly loam in the middle and lower parts. The substratum to a depth of 60 inches is dark brown and light brownish gray very gravelly loamy sand.

Typically, the Palmyra soil has a surface layer of very dark grayish brown gravelly loam about 9 inches thick.

The subsoil extends to a depth of 28 inches. It is brown gravelly loam in the upper part, brown gravelly heavy loam in the middle part, and brown gravelly light clay loam in the lower part. The substratum is grayish brown very gravelly loamy sand in the upper part and grayish brown very gravelly sand in the lower part.

Included with these soils in mapping are small intermingled areas of less sloping Chenango soils and Arkport soils. The Arkport soils do not have gravel but have a high sand content. In some areas the surface layer is cobbly. The included soils range up to 2 acres.

In the Chenango soil, permeability is moderate or moderately rapid in the subsoil and rapid in the substratum; and in the Palmyra soil, permeability is moderate in the subsoil and very rapid in the substratum. The available water capacity is low to moderate in the Chenango soil and moderate in the Palmyra soil. Runoff is rapid, and bedrock is deeper than 5 feet in both soils. Gravel makes up 15 to 30 percent of the surface layer of both. In unlimed areas, the Chenango soil is strongly acid or very strongly acid in the surface layer and the Palmyra soil is medium acid to neutral.

Because of the steep slopes, these soils are not suited to farming and urban uses. Most of the acreage is wooded or is idle.

These Chenango and Palmyra soils are not suitable for cultivated crops and hay crops because of the steep slopes. Erosion is a very serious hazard if the cover of sod or trees is removed. The use of farm machinery is nearly impossible because of the steep and often complex slopes. Some areas can be used for pasture, although pasture quality is usually poor because it is difficult to reseed and fertilize. Droughtiness of the soils in midsummer also causes pasture yields to be low. Overgrazing during dry periods weakens the sod cover and can cause serious erosion.

The potential of this map unit for wood crops is fair to good. The steep slopes seriously limit the use of planting and harvesting equipment. Erosion is also a serious hazard. Placing logging trails on the contour as much as possible reduces trail gullying. More seedlings will survive if they are hand planted early in the spring.

The short, steep slopes and the potential for seepage are serious limitations for most urban uses of these soils. Areas that are cleared of vegetation are subject to serious erosion. Excavated areas should be revegetated as soon as possible to prevent erosion and the siltation of nearby streams. This map unit is usually a good source of gravel. Wooded areas often provide habitat for wildlife.

These Chenango and Palmyra soils are in capability subclass VIe.

Cn—Chippewa silt loam. This soil is deep, nearly level, and poorly drained. It is in small depressional areas on the upland plateau. It formed in dense glacial till. Slope ranges from 0 to 3 percent. Areas of this soil are roughly oblong and range from 5 to 50 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of very dark gray silt loam about 7 inches thick. The subsurface layer is mottled, grayish brown silt loam about 6 inches thick. The subsoil is firm and brittle, dark grayish brown channery silt loam about 23 inches thick. The substratum is very dark grayish brown channery silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Lyons, Erie, and Volusia soils. The Lyons soils do not have a fragipan, and the Erie and Volusia soils are on slightly higher, better drained benches and low knolls. The included areas are 1/4 acre to 2 acres.

This Chippewa soil has a perched water table at or near the surface from November through May. Permeability is moderate above the fragipan layer and very slow or slow in the fragipan and substratum. The dense fragipan layer restricts root penetration. The available water capacity is low, but generally there is sufficient moisture for plant growth. Runoff is very slow. The surface layer is very strongly acid to slightly acid, and the fragipan is strongly acid to neutral.

This soil is poorly suited to farming and urban uses. Most of the acreage is pastured, is in woodland, or is idle.

This Chippewa soil is poorly suited to cultivated crops, unless drained. Drainage is difficult because there are no suitable outlets and because of the dense subsoil fragipan layer. If this soil is drained, keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops improve tilth and help maintain organic matter content. Although the low available water capacity of the soil restricts rooting depth, there is generally sufficient moisture from lateral seepage across the top of the fragipan to sustain plant growth.

This soil has limited suitability for pasture. Grazing during wet periods causes compaction of the soil and trampling of grasses, which can reduce plant growth and result in poorer quality forage. Partial drainage improves the use of most areas for pasture.

The potential of this soil for wood crops is poor, although many areas are wooded. Because of prolonged wetness, use of equipment is limited and seedling mortality is high. Uprooting of trees during windstorms is a serious hazard because of the shallow rooting depth.

The prolonged high water table and the slowly or very slowly permeable fragipan are serious limitations for most urban uses of this soil. Drainage of areas to make them suitable building sites is very difficult because they are low on the landscape. Many areas are well suited to the development of wetland wildlife habitat or ponds.

This Chippewa soil is in capability subclass IVw.

CoA—Churchville silt loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in a thin mantle of clayey lake sediments underlain by glacial till. This soil is on broad flats of the lowland till plain. Areas of this soil are oblong or irregular in shape and range from 10 to 200 acres.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsurface layer is mottled, pinkish gray silt loam about 2 inches thick. The subsoil is 15 inches thick. The upper part of the subsoil is reddish brown silty clay loam, and the lower part is firm, mottled, reddish brown silty clay. The substratum is very firm, mottled, reddish gray gravelly loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Ovid, Odessa, Remson, and Darien soils. The Ovid and Darien soils do not have a clayey mantle, and the Remson and Odessa soils formed in thicker clayey deposits than this Churchville soil. Included wet spots and drainageways are indicated by special symbols on the soil map. Areas of included soils are 1/4 acre to 2 acres.

This Churchville soil has a perched seasonal high water table in the upper part of the subsoil from December through May and is susceptible to ponding in some areas. Rooting depth is limited by the seasonal high water table. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. Bedrock is at a depth of 5 feet or more. The surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

This soil is moderately suited to farming. It has serious limitations for most urban uses. Most of the acreage is in pasture, hay, or woodland, or it is idle. Some areas are used for cultivated crops.

This gravel-free Churchville soil can be used for selected crops, but seasonal wetness delays planting and reduces the growing period. If properly drained, it is suited to many crops grown in the region. In some areas, drainage outlets are not available. Drains generally require close spacing to be effective because of the slowly or very slowly permeable, clayey subsoil. Tilling at the proper moisture content minimizes the hazard of crusting and clodding of this soil. Using cover crops, returning crop residues to the soil, and including sod crops in the cropping system help maintain good tilth and reduce crusting and clodding.

This soil is suited to wetness-tolerant hay and pasture plants. Restricting grazing during wet periods reduces soil compaction and trampling of pasture grasses and results in a better and more productive pasture.

The potential of this soil for wood crops is fair. The use of equipment is somewhat limited, however, by seasonal wetness. Trees can be uprooted during windstorms because the rooting depth is restricted by wetness.

Seasonal wetness, slow or very slow permeability, a clayey subsoil, and danger of frost heaving are serious limitations for many urban uses of this soil. Recompacting the soil when it is disturbed is often difficult because of the high clay content. Establishing lawns can also be difficult, particularly if the heavy textured subsoil is mixed with the topsoil. Some areas are suitable for recreational uses, but seasonal wetness can be a limitation. Many areas provide sites for dugout ponds.

This Churchville soil is in capability subclass IIIw.

CoB—Churchville silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in a thin mantle of clayey lake sediments underlain by glacial till. It is on plateau shoulders that are above the valley sides and is in lower undulating areas. Areas of this soil are oblong or irregular in shape and range from 10 to 200 acres.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsurface layer is mottled, pinkish gray silt loam about 2 inches thick. The subsoil is 15 inches thick. The upper part of the subsoil is reddish brown silty clay loam, and the lower part is firm, mottled, reddish brown silty clay. The substratum is very firm, mottled, reddish gray gravelly loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Ovid, Odessa, Remson, and Darien soils. The Ovid and Darien soils do not have a clayey mantle, and the Remson and Odessa soils formed in thicker clayey deposits than this Churchville soil. Included wet spots and drainageways are indicated by special symbols on the soil map. Areas of included soils are 1/4 acre to 2 acres.

A perched seasonal high water table is in the upper part of the subsoil of this Churchville soil from December through May and limits the rooting depth. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow to medium. There is usually no gravel in the surface layer. Bedrock is at a depth of 5 feet or more. The surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

This soil is moderately suited to farming. It has serious limitations for most urban uses. Most of the acreage is in pasture, hay, or woodland or is idle. Some areas are used for cultivated crops.

This gravel-free Churchville soil can be used for selected field crops, but seasonal wetness delays planting and reduces the growing period. If properly drained, it is suited to many crops grown in the region. Drains generally require close spacing to be effective because the clayey subsoil is slowly or very slowly permeable. Interceptor drains help in some areas to divert runoff and subsurface seepage from higher adjacent soils. Tilling of this soil at the proper moisture content minimizes the hazard of surface crusting and clodding of this soil. Erosion is a hazard in intensively cultivated areas. Using cover crops, returning crop residues to the soil, and including sod crops in the cropping system help maintain good tilth and reduce the threat of crusting and clodding. These practices and contour tillage also minimize the erosion hazard.

This soil is suited to wetness-tolerant hay and pasture plants. Restricting grazing during wet periods reduces soil compaction and the trampling of pasture grasses and increases the production of the pasture.

The potential of this soil for wood crops is fair. Use of equipment is somewhat limited by seasonal wetness. Trees can be uprooted during windstorms because the rooting depth is restricted.

Seasonal wetness, slow or very slow permeability, a clayey subsoil, and danger of frost heaving are serious limitations for most urban uses of this soil. Recompacting the soil when it is disturbed is often difficult because of the high clay content. Establishing lawns also can be difficult, particularly if the heavy textured subsoil is mixed with the topsoil. Where the soil is disturbed during construction, revegetating the sites as soon as possible helps prevent serious erosion.

This Churchville soil is in capability subclass IIIw.

CrA—Claverack loamy fine sand, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It formed in a mantle of sandy lake sediments and the underlying clayey lake-laid deposits. The sandy mantle is 20 to 40 inches thick. This soil is on the slightly elevated position of the lowland lake plain. Areas of this soil are oblong or irregular in shape and range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of dark brown loamy fine sand about 10 inches thick. The subsoil is 35 inches thick. The upper part is strong brown and brown loamy fine sand, the middle part is mottled, dark brown fine sandy loam, and the lower part is mottled, dark brown clay. The substratum is mottled, reddish brown clay to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Cosad, Cheektowaga, Galen, and Minoa soils. The Cosad and Cheektowaga soils are on foot slopes and along some drainageways. The Galen and Minoa soils formed mainly in sandy loam that is not underlain by clayey deposits. Also included in mapping are small areas of gently sloping soil. In some areas the sandy mantle is shallower than 20 inches, and in a few other areas it is deeper than 40 inches. In a few areas the surface layer is fine sandy loam. The included areas are 1/4 acre to 3 acres.

From November through May this Claverack soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is rapid in the upper sandy mantle and slow or very slow in the fine textured substratum. The available water capacity is low to moderate. There are generally no rock fragments in the soil. Depth to bedrock is 5 feet or more. The surface layer and subsoil are strongly acid to neutral, unless limed.

This soil is moderately suited to farming. It has limitations for some urban uses. Most areas, however, are urbanized, particularly in the northern part of the county. Some areas are cultivated or in pasture, or they are idle.

The Claverack soil is suited to cultivated crops, but the temporary seasonal wetness in the spring, droughtiness in summer, sandy texture, and low organic matter content are some limitations. Vegetable crops do well on this soil if irrigation water is available and fertilizer is applied frequently. The management of many fields can be improved with subsurface drainage of included wet spots. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and including sod crops in the cropping system help maintain good tilth and improve the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. This gravel-free soil is easy to till once it dries in the spring.

This soil is moderately suited to hay and pasture, but droughtiness in midsummer can reduce plant growth. Overgrazing and grazing when the soil is wet are chief management concerns. Grazing during wet periods causes soil compaction and trampling of grasses, and it can reduce yields and lead to the loss of pasture seeding.

The potential of this soil for wood crops is fair to good. There are few management problems associated with the use of this soil for woodland. Although seedling mortality is generally not a problem, planting seedlings early in the spring helps insure their survival.

Temporary seasonal wetness and slow or very slow permeability in the substratum are limitations for some urban uses of this soil. Walls of excavations tend to slough or slump, particularly when the soil is saturated. Frequent fertilization and irrigation in the dry summer months help maintain lawns and sod-covered recreation areas. Although the sandy texture is a problem, most areas are good sites for recreational uses, particularly uses requiring a nearly level site.

This Claverack soil is in capability subclass IIw.

CrB—Claverack loamy fine sand, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in a mantle of sandy sediments and the underlying clayey lake-laid deposits. The sandy mantle is 20 to 40 inches thick. This soil is on convex knolls and ridges on slightly elevated parts of the lowland lake plain. Areas of this soil are oblong or irregular in shape and range from 3 to 80 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of dark brown loamy fine sand about 10 inches thick. The subsoil is 35 inches thick. The upper part is strong brown and brown loamy fine sand; the middle part is mottled, dark brown fine sandy loam; and the lower part is mottled, dark brown clay. The substratum is mottled, reddish brown clay to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of Cosad, Cheektowaga, Galen, and Minoa soils. The Cosad and Cheektowaga soils are on foot slopes and along some drainageways. The Galen and Minoa soils formed mainly in sandy loam that is not underlain by clayey deposits. Also included in mapping are small areas that are nearly level. In some areas the sandy mantle is shallower than 20 inches, and in a few other areas it is deeper than 40 inches. In a few areas the surface layer is fine sandy loam. The included areas are 1/4 acre to 3 acres.

From November through May this Claverack soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is rapid in the upper sandy mantle and slow or very slow in the fine textured substratum. The available water capacity is low to moderate, and runoff is slow to medium. There are generally no rock fragments in the soil. Depth to bedrock is 5 feet or more. The surface layer and subsoil are strongly acid to neutral, unless limed.

This soil is moderately suited to farming. It has limitations for some urban uses. Most areas, however, are urbanized, particularly in the northern part of the county. Some areas are cultivated or are in hay or pasture, and a few areas are idle.

The Claverack soil is suited to cultivated crops, but the temporary seasonal wetness in the spring, droughtiness in the summer, sandy texture, erosion hazard, and low organic matter content are some limitations. Vegetable crops do very well on this soil if irrigation water is available and fertilizer is applied frequently. This soil is more difficult to irrigate than the nearly level Claverack soil. The management of many fields can be improved with subsurface drainage of included wet spots. Erosion is a particular hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, and including sod crops in the cropping system help maintain good tilth, control erosion, and improve the organic matter content. Increasing the organic matter content improves the available water capacity of the soil. This gravel-free soil is easy to till once it dries in the spring.

This soil is moderately suited to hay and pasture, but droughtiness in midsummer can reduce plant growth. Overgrazing and grazing when the soil is wet are the main management concerns. Grazing during wet periods causes soil compaction and trampling of grasses, and it can reduce yields and lead to the loss of the pasture seeding.

The potential of this soil for wood crops is fair to good. There are few management problems associated with the use of this soil for woodland. Although seedling mortality is generally not a problem, planting seedlings early in the spring helps insure their survival. Placing logging trails across the slope reduces the hazard of trail gullying.

Temporary seasonal wetness and slow or very slow permeability of the clayey substratum are limitations for some urban uses of this soil. Interceptor drains and drains around foundations minimize the seasonal wetness. Sidewalls of excavations tend to slough or slump, particularly when the soil is saturated. Frequent fertilization and irrigation in the dry summer months help maintain lawns and sod-covered recreation areas. Although the sandy texture is a slight problem, most areas are good sites for recreational uses, such as for campsites and picnic areas.

This Claverack soil is in capability subclass IIw.

CsA—Collamer silt loam, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It is on elevated benches on the lowland lake plain in the northern part of the county and in scattered areas in the southern part of the county. This soil formed in glacial lake deposits with a high silt content. Areas of this soil range from 5 to 50 acres and are roughly circular.

Typically, this soil has a surface layer of dark grayish brown silt loam about 10 inches thick. The subsurface layer is pale brown light silt loam about 2 inches thick. The upper part of the subsoil, to a depth of 20 inches, is mottled, brown silt loam with pale brown light silt loam interfingering from the layer above. The lower part of the subsoil is mottled, dark yellowish brown silty clay loam about 12 inches thick. The substratum is brown silt loam with varves of very fine sand and silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Hudson, Schoharie, and Niagara soils. The Schoharie and Hudson soils have a higher clay content than the Collamer soil. The somewhat poorly drained Niagara soils are along some drainageways and on concave foot slopes. Areas of included soils range from 1/2 acre to 3 acres.

This Collamer soil has a seasonal high water table in the lower part of the subsoil during the spring. Permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. It is moderately slow or slow in the substratum. The available water capacity is high, and runoff is slow to medium. There is usually no gravel in the soil. Depth to bedrock is 5 feet or more. This soil is strongly acid to neutral in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is well suited to farming. It has some limitations for urban uses. Many areas are used for cultivated crops and hay. Some areas are in residential developments, and a few areas are idle.

This silty Collamer soil is well suited to most crops grown in the area. It is especially well suited to vegetable crops, but planting can be delayed because of seasonal wetness in the spring. Drainage of wet spots allows for earlier tillage of many fields. This gravel-free soil is easy to till once it dries in the spring. Keeping tillage to a minimum, using cover crops, returning crop residues to the soil, tilling at the proper soil moisture content, and rotating crops help maintain tilth and improve organic matter content.

This soil is well suited to pasture and hay. Restricting grazing early in the spring when the soil is wet prevents soil compaction and trampling of grasses and increases the production of pasture.

The potential of this soil for wood crops is very good, but only a small acreage is wooded. There are few restrictions to the use of equipment, and erosion is generally not a hazard. Seedling mortality is usually very low.

Temporary seasonal wetness, moderately slow permeability in the subsoil, instability of cutbanks, low soil strength, and high potential frost damage are limitations for many urban uses of this Collamer soil. Erosion is a problem in disturbed or excavated areas. Subsurface drains around foundations minimize the wetness caused by the seasonal high water table. This soil is usually a good source of topsoil. Many areas are well suited to recreational uses, particularly those requiring a nearly level, gravel-free site.

This Collamer soil is in capability subclass IIw.

CsB—Collamer silt loam, 3 to 8 percent slopes. This gently sloping and undulating soil is deep and moderately well drained. It is on convex shoulders of drainageways on the lowland lake plain in the northern part of the county and in scattered areas in the southern part. This soil formed in glacial lake deposits that have a high silt content. Areas of this soil range from 3 to 50 acres and are roughly oblong.

Typically, this soil has a surface layer of dark grayish brown silt loam about 10 inches thick. The subsurface layer is pale brown light silt loam about 2 inches thick. The upper 8 inches of the subsoil is mottled, brown silt loam with pale brown light silt loam interfingering from the layer above. The lower part of the subsoil is mottled, dark yellowish brown silty clay loam about 12 inches thick. The substratum is brown silt loam with varves of very fine sand and silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Hudson, Schoharie, Niagara, and Canandaigua soils. The Schoharie and Hudson soils have a higher clay content than this Collamer soil. The somewhat poorly drained Niagara soils are along the bottom of drainageways and on concave foot slopes. The poorly drained and very poorly drained Canandaigua soils are in small depressions. Areas of included soils range from 1/2 acre to 3 acres.

This Collamer soil has a seasonal high water table in the lower part of the subsoil during the spring. Permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. It is moderately slow or slow in the substratum. The available water capacity is high, and runoff is medium. There is usually no gravel in the soil. Depth to bedrock is 5 feet or more. This soil is strongly acid to neutral in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is well suited to farming. It has some limitations for urban uses. Many areas are used for cultivated crops and hay. Some areas are in residential and industrial developments, and a few areas are idle.

This silty Collamer soil is well suited to most crops grown in the area. It is especially well suited to vegetable crops, but planting can be delayed because of seasonal wetness in the spring. The use of interceptor drains to divert runoff from higher adjacent soils and drainage of wet spots makes earlier tilling of many fields possible. This gravel-free soil is easy to till once it dries in the spring, but erosion is a serious hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, returning crop residues to the soil, tilling across slopes, plowing at the proper soil moisture content, and rotating crops help maintain tilth, improve organic matter content, and reduce erosion.

This soil is well suited to pasture and hay. Restricting grazing early in the spring when the soil is wet prevents soil compaction and trampling of grasses and increases the production of the pasture.

The potential of this soil for wood crops is very good, but only a small acreage is wooded. There are few restrictions to the use of equipment. Erosion is generally not a problem, but placing logging trails on the contour reduces trail gullying.

The temporary seasonal wetness, moderately slow permeability in the subsoil, instability of cut banks, low soil strength, erosion hazard, and high potential frost damage are limitations for many urban uses of this Collamer soil. Revegetating disturbed areas as soon as possible reduces the erosion hazard. Subsurface drains around foundations and interceptor drains that divert seepage from higher adjacent slopes minimize the spring wetness. This soil is usually a good source of topsoil. Some areas are suited to recreationsal uses, such as campsites. This Collamer soil tends to be more unstable and has lower soil strength than the Collamer soil that has a loamy substratum.

This Collamer soil is in capability subclass IIe.

CsC—Collamer silt loam, 8 to 15 percent slopes. This sloping and rolling soil is deep and moderately well drained. It is on convex side slopes along drainageways and on ridges in the northern part of the county and in scattered areas in the southern part of the county. This soil formed in glacial lake deposits with a high silt content. Areas of this soil range from 3 to 30 acres and are generally elongated.

Typically, this soil has a surface layer of dark grayish brown silt loam about 10 inches thick. The subsurface layer is pale brown light silt loam about 2 inches thick. The upper 8 inches of the subsoil is mottled, brown silt loam with pale brown light silt loam interfingering from the layer above. The lower part of the subsoil is mottled, dark yellowish brown silty clay loam about 12 inches thick. The substratum is brown silt loam with varves of very fine sand and silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Hudson, Schoharie, Williamson, and Niagara soils. The Schoharie and Hudson soils have a higher clay content than this Collamer soil. The Williamson soils have a dense fragipan layer in the subsoil. The somewhat poorly drained Niagara soils are along some drainageways and on concave foot slopes. In some areas the soil is gently sloping. Areas of included soils range from 1/2 acre to 3 acres.

This Collamer soil has a seasonal high water table in the lower part of the subsoil during the spring. Permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. It is moderately slow or slow in the substratum. The available water capacity is high, and runoff is rapid. There is usually no gravel in the soil. Depth to bedrock is 5 feet or more. This soil is strongly acid to neutral in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is moderately suited to farming. It has limitations for urban uses. Many areas are used for pasture and hay or woodland. Some areas are cultivated, are in residential developments, or are idle.

This silty Collamer soil is moderately suited to some crops commonly grown in the area. Erosion is a serious hazard where cultivated crops are grown. Planting can be delayed because of seasonal wetness in the spring. Drainage of wet spots allows for earlier tilling of many fields. Interceptor drains that divert seepage and runoff from higher adjacent soils reduce the hazard of erosion and dry the soil earlier in the spring. If cultivated crops are grown, keeping tillage to a minimum, stripcropping, using cover crops, returning crop residues to the soil, tilling on the contour, plowing at the proper soil moisture content, and including sod crops in the cropping system help maintain tilth, improve organic matter content, and control erosion.

This soil is better suited to pasture and hay than to row crops. Restricting grazing early in the spring when the soil is wet prevents soil compaction and trampling of grasses and increases the production of pasture.

The potential of this soil for wood crops is good. Placing logging trails on the contour reduces the hazard of trail gullying. Seedling mortality is usually very low.

The temporary seasonal wetness, serious erosion hazard, moderately slow permeability in the subsoil, instability of cut banks, low soil strength, and high risk of frost damage are serious limitations for many urban uses of this Collamer soil. Subsurface drains around foundations and interceptor drains upslope from buildings minimize the effects of seasonal wetness. Reestablishing vegetation on disturbed areas as soon as possible is important for controlling erosion. Excavations on toe-slopes can lead to massive slumps or slides. It is generally easy to establish lawns on this soil.

This Collamer soil is in capability subclass IIIe.

CtB—Collamer silt loam, till substratum, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in silty glacial lake sediments 3-1/2 to 5 feet thick underlain by loamy glacial till deposits. This soil is on elevated parts of lowland lake plains and in some valleys. Areas of this soil are roughly circular or irregular in shape and range from 3 to 50 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam about 8 inches thick. The subsurface layer is mottled, pale brown light silt loam about 2 inches thick. The subsoil extends to a depth of 48 inches. It is mottled, brown silt loam in the upper part; mottled, brown heavy silt loam in the middle part; and mottled, dark yellowish brown silty clay loam in the lower part. The substratum to a depth of 60 inches is mottled, dark grayish brown gravelly silt loam.

Included with this soil in mapping are small intermingled areas of the Hudson, Scio, Niagara, and Canandaigua soils. The Hudson soils have a higher clay content than the Collamer soil, and the Scio soils have a lower clay content. The somewhat poorly drained Niagara soils are on a few foot slopes and along some drainageways, and the poorly drained and very poorly drained Canandaigua soils are in a few depressions. Wet spots are indicated on the soil map by special symbol. On a few small areas slope is as much as 15 percent, and in some areas the soil is not underlain by loamy glacial till. The included areas range from 1/4 acre to 3 acres.

This Collamer soil has a seasonal water table that rises into the subsoil during the spring. Permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. It is moderately slow or slow in the loamy substratum. The available water capacity is high, and runoff is medium. There is usually no gravel in the surface layer and subsoil, but it is usually in the substratum. Depth to bedrock is 5 feet or more. The surface layer is strongly acid to neutral, and the subsoil is medium acid to mildly alkaline.

This soil is suited to farming. It has some limitations for urban uses. Most of the acreage is used for cultivated crops, hay, or pasture. Some areas are idle, and a few areas are urbanized.

The Collamer soil is well suited to most crops grown in the county, especially vegetable crops. Wetness in the spring can delay planting, and erosion is a hazard where the soil is cultivated intensively. This gravel- and stone-free soil is easy to till once it dries in the spring. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling at the proper soil moisture level, tilling on the contour, and including sod crops in the cropping system help maintain tilth and reduce the hazard of erosion.

This soil is suited to pasture and hay crops. Grazing when the soil is wet causes compaction and destroys pasture grasses. Restricting grazing in the spring increases the time needed between pasture seedings.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Erosion in wooded areas is generally not a hazard. Where trail gullying is a hazard, it can be reduced by placing logging trails across the slope. Seedling mortality is usually not a problem on this soil.

Temporary seasonal wetness, moderately slow permeability in the subsoil, instability of cut banks, low soil strength, and high risk of frost damage are some limitations for urban uses of this soil. Basements and foundations need special protection, such as subsurface drains, to overcome the wetness caused by the seasonal high water table. Interceptor drains placed upslope help divert surface runoff and subsurface seepage from buildings. Because this soil is highly erosive, construction sites need protection from siltation and gullying. This soil tends to be more stable and provides more strength than the other Collamer soils because it has a firm, glacial till substratum. However, excavations or cuts can slump or slip when the soil is saturated. Many areas are suited to recreation uses, such as campsites and picnic areas.

This Collamer soil is in capability subclass IIe.

CuB—Colonie loamy fine sand, 3 to 8 percent slopes. This gently sloping soil is deep and well drained to somewhat excessively drained. It formed in lake-laid or windblown deposits that are dominantly fine sand. It is in undulating areas of the lowland lake plain. Areas of this soil are irregular in shape and range from 3 to 50 acres.

Typically, this soil has a surface layer of dark grayish brown loamy fine sand about 7 inches thick. The subsoil extends to a depth of 60 inches. It is strong brown loamy fine sand in the upper part, yellowish brown loamy fine sand in the middle part, and pale brown fine sand in the lower part. Thin, brown, horizontal bands are in the lower part of the subsoil. The substratum is light grayish brown fine sand to a depth of 70 inches or more.

Included with this soil in mapping are small intermingled areas of the Elnora, Arkport, and Galen soils. The moderately well drained Elnora soils are on some foot slopes. The Arkport soils have thicker and more clayey bands in the subsoil than this Colonie soil. The Galen soils are slightly wetter and have a higher clay content than this Colonie soil. Also included are small areas of the somewhat poorly drained Minoa soils in slight depressions. Areas of included soils are 1/4 acre to 3 acres.

Permeability throughout this Colonie soil is moderately rapid or rapid, except that in some places the thin horizontal bands in the subsoil have slightly slower permeability. The available water capacity is low, and runoff is slow to medium. Bedrock is at a depth of 5 feet or more. In unlimed areas, the surface layer and subsoil are strongly acid to slightly acid.

This soil is only moderately suited to farming. It is suited to some urban and recreational uses. Most of the acreage is idle, but some areas are cultivated or pastured, and a few areas are in urban development.

This sandy Colonie soil can be used for cultivated crops, but growth is restricted because of midsummer droughtiness and low natural fertility. This soil is productive for many crops, particularly vegetable crops, if irrigated and liberally limed and fertilized. Tillage is generally easy on this gravel- and stone-free soil. Water erosion is a minor hazard on long slopes and where the soil is intensively cultivated. Wind erosion can also be a hazard where the vegetative cover has been removed. Management that builds up organic matter levels and helps maintain tilth includes keeping tillage to a minimum, using cover crops, adding animal wastes to the soil, returning crop residues to the soil, and including sod crops in the cropping system. This soil is well suited to a no-till system.

Because of the very low organic matter content, droughtiness, and sandy texture, this soil is only moderately suited to pasture and hay. Some areas can be used for early-season pasture, but plant growth by midsummer is usually sparse. Overgrazing during the drier summer months can cause the loss of the pasture grasses.

The potential of this soil for wood crops is fair to poor. Seedling mortality is a major hazard because of the droughtiness of the soil. Seedlings should be planted very early in the spring when the soil moisture content is optimum for seedling survival.

This soil provides suitable sites for dwellings and other structures. Droughtiness is a limitation for lawns, however, and seepage from septic tank absorption fields may contaminate ground water. Water and wind erosion can be a problem during construction when the soil is disturbed and vegetation removed. Because this soil is loose, the sides of excavations or cuts tend to slough or slump.

This Colonie soil is in capability subclass IIIs.

CuC—Colonie loamy fine sand, 8 to 15 percent slopes. This sloping soil is deep and well drained to somewhat excessively drained. It formed in lake-laid or windblown deposits that are dominantly fine sand. It is in rolling areas and on side slopes of dissected landscapes on the lowland lake plain. Areas of this soil are elongated and convex and range from 3 to 25 acres.

Typically, this soil has a surface layer of dark grayish brown loamy fine sand about 7 inches thick. The subsoil extends to a depth of 60 inches. It is strong brown loamy fine sand in the upper part, yellowish brown loamy fine sand in the middle part, and pale brown fine sand in the lower part. There are thin, brown, horizontal bands in the lower part of the subsoil. The substratum is light grayish brown fine sand to a depth of about 70 inches.

Included with this soil in mapping are small intermingled areas of the Elnora, Arkport, and Galen soils. The moderately well drained Elnora soils are on some foot slopes. The Arkport soils have thicker and more clayey bands in the subsoil than this Colonie soil. The Galen soils are slightly wetter and have a higher clay content than this Colonie soil. Some areas are gently sloping. Areas of included soils are 1/4 acre to 3 acres.

Permeability throughout this Colonie soil is moderately rapid or rapid. In places the thin horizontal bands in the subsoil have slightly slower permeability. The available water capacity is low, and runoff is medium. Bedrock is at a depth of 5 feet or more. In unlimed areas, the surface layer and subsoil are strongly acid to slightly acid.

This soil has limited suitability for farming and urban uses. Most of the acreage is idle, or is used for pasture or woodland.

This sandy Colonie soil is not well suited to cultivated crops because of slope, midsummer droughtiness, and low natural fertility. Water erosion is a hazard, particularly on long slopes and where the soil is cultivated. Irrigation improves crop production, but irrigation water increases the erosion hazard. Wind erosion can also be a hazard where the vegetative cover has been removed. If cultivated crops are grown, management that builds up organic matter levels, helps maintain good tilth, and controls erosion includes keeping tillage to a minimum, using cover crops, tilling across the slope, adding animal wastes to the soil, returning crop residues to the soil, and including sod crops in the cropping system. This Colonie soil is suited to a no-till system.

Because of the very low organic matter content, droughtiness, and sandy texture, this soil is only moderately suited to pasture and hay. Some areas can be used for early-season pasture, but plant growth by midsummer is usually sparse. Overgrazing during the drier summer months can cause the loss of the pasture grasses and increases the hazard of erosion.

The potential of this soil for wood crops is fair to poor because it has low natural fertility and low available water capacity. Seedling mortality is a major hazard because of droughtiness. Seedlings should be planted very early in the spring when the soil moisture content is optimum for seedling survival. Placing logging trails across the slope reduces the erosion hazard.

Slope is a limitation for some urban uses of this soil. Droughtiness makes the establishment and maintenance of lawns difficult. Because of the moderately rapid or rapid permeability, seepage from septic tank absorption fields may contaminate ground water. Water and wind erosion can be serious problems during construction when the soil is disturbed and vegetation removed. Because this soil is loose, the sides of excavations or cuts in foot slopes tend to slough or slump. Some areas are suitable for certain recreational uses.

This Colonie soil is in capability subclass IVs.

Cv—Cosad loamy fine sand. This nearly level soil is deep and somewhat poorly drained. It formed in sandy lake-laid sediments underlain by clayey deposits. This soil is in nearly flat areas on lake plains. Slope ranges from 0 to 3 percent. Areas of this soil range from 5 to 100 acres or more and are usually irregular in shape.

Typically, this soil has a surface layer of very friable, very dark grayish brown loamy fine sand 9 inches thick. The subsoil is about 23 inches thick. It is mottled, yellowish brown loamy fine sand in the upper part; mottled, brown fine sandy loam in the middle part; and firm, mottled, brown silty clay in the lower part. The substratum to a depth of 60 inches is firm, reddish brown and brown silty clay.

Included with this soil in mapping are the poorly drained and very poorly drained Cheektowaga soils in slight depressions and along some drainageways and the Claverack soils on small convex knolls. Also included, where the sandy mantle is very thin, are areas of the Odessa and Rhinebeck soils and, where the mantle thickens, areas of the Minoa soils and a wetter Lamson soil. Included wet spots, gravelly spots, and drainageways are indicated by special symbols on the soil map. Also included are some large areas where the surface layer is fine sandy loam. Areas of included soils range from 1/4 acre to 2 acres.

This Cosad soil has a perched seasonal high water table in the upper part of the subsoil from November through May, which restricts rooting depth. Permeability is rapid in the sandy surface layer and upper part of the subsoil and slow or very slow in the clayey lower part of the subsoil and the substratum. The available water capacity is low to moderate, and runoff is very slow. This soil is generally free of rock fragments. In unlimed areas, reaction ranges from strongly acid through slightly acid in the surface layer and in the upper part of the subsoil.

This Cosad soil is moderately suited to farming if adequately drained. It is poorly suited to most urban uses. Some areas are used for hay and cultivated crops, but many areas that were originally cleared are now idle. Some areas are used for urban development.

Without artificial drainage, this Cosad soil is poorly suited to cultivated crops, but it is suited to common field crops if adequately drained and liberally fertilized and limed. Because the soil has a low capacity to store nutrients, partial application of fertilizer, particularly nitrogen, should be made while the crop is growing. This gravel-free soil is easy to till when it is drained. In drained areas, droughtiness is a midsummer problem in dry years. Keeping tillage to a minimum, incorporating crop residues into the soil, including sod crops in the cropping system, and tilling at the proper moisture content help maintain good tilth and increase the organic matter content. Increasing the organic matter content improves the available water capacity and nutrient storing capacity of the soil.

In undrained areas, this soil is suited to some wetness-tolerant hay and pasture plants. Restricting grazing during wet periods and not overgrazing help maintain high quality pasture and prolong the productive life of the seedings.

The potential of this soil for wood crops is fair. The use of equipment is somewhat limited by seasonal wetness. Seedling mortality and uprooting of trees during windstorms are also problems related to wetness.

The seasonal high water table and slow or very slow permeability in the clayey substratum are serious limitations for many urban uses of this soil. Low soil strength and the tendency of excavations to slump or slide are limitations for some uses.

This Cosad soil is in capability subclass IIIw.

DaB—Danley silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in shaly glacial till deposits on till plains in the central and north-central sections of the county. Most areas of this soil are oblong or irregular in shape and range from 3 to 50 acres or more.

Typically, this soil has a surface layer of dark grayish brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is 26 inches thick. The upper 16 inches is dark brown silty clay loam, and the lower part is mottled, olive silty clay loam. The substratum to a depth of 60 inches or more is mottled, grayish brown shaly clay loam.

Included with this soil in mapping are small areas of the sloping Danley soils and soils that are similar to the Danley soil but are nearly level. Also included are small areas of the Darien, Aurora, and Niagara soils. The somewhat poorly drained Darien soils are on foot slopes and along drainageways, the Aurora soils are underlain by bedrock at a depth of 20 to 40 inches, and the Niagara soils, which formed in silty lake-laid deposits, are underlain by glacial till deposits. In some small areas, this Danley soil is covered by a very thin layer of sand or gravel. Areas of included soils make up 20 to 30 percent of this map unit and range from 1/4 acre to 3 acres.

In the spring this Danley soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is medium. Rock fragments, mostly shale, range from 3 to 15 percent in the surface layer. Depth to bedrock is usually 5 feet or more. Reaction ranges from strongly acid to slightly acid in the surface layer and from medium acid to neutral in the subsoil.

Because of its seasonally perched water table and slow permeability this soil has limited suitability for some uses. Most areas are suitable for farming. Current land use is mixed and includes residential, farming, woodland, and idle land.

This Danley soil is suitable for cultivated crops, but temporary seasonal wetness can delay early spring planting. Erosion is a moderate hazard that can be controlled by keeping tillage to a minimum, using cover crops, stripcropping, tilling on the contour, and including sod crops in the cropping system. Random subsurface drains to wetter included spots improve the use of many fields. Drains often have to be closely spaced because of the slow water movement through the subsoil and substratum. This soil is suitable for most field crops grown in the county, if good tilth and fertility levels are maintained.

Many areas are suitable for pasture, but grazing during wet periods and overgrazing should be avoided to maintain quality pasture seedings.

The potential of this soil for wood crops is good. The hazards of erosion and of trees uprooting during windstorms and limitations to equipment use on this soil are minor. Seedlings should be planted in the spring when the soil is moist to prevent a high mortality.

The temporary seasonally high water table and slow permeability in the substratum are serious limitations for many urban uses of this Danley soil. Basements are often difficult to keep dry, but interceptor drains upslope from the dwelling reduce this problem by diverting surface and subsurface water around the structure. Frost action is a hazard for roads and small buildings without basements. Some areas are suitable for recreational uses. Many areas are good sites for small ponds.

This Danley soil is in capability subclass IIe.

DaC—Danley silt loam, 8 to 15 percent slopes. This sloping soil is deep and moderately well drained. It formed in shaly glacial till deposits. This soil is on hillsides and valley sides on till plains near the northern edge of the upland plateau. Most areas of this soil are oblong and range from 3 to 50 acres or more.

Typically, this soil has a surface layer of dark grayish brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is 26 inches thick. The upper 16 inches is dark brown silty clay loam, and the lower part is mottled, olive silty clay loam. The substratum to a depth of 60 inches or more is mottled, grayish brown shaly clay loam.

Included with this soil in mapping are small areas of the moderately steep and gently sloping Danley soils. Also included are small areas of the Darien and Aurora soils. The somewhat poorly drained Darien soils are on foot slopes and along drainageways, and the Aurora soils are underlain by bedrock at a depth of 20 to 40 inches. In some small areas, this Danley soil is covered by a very thin layer of sand or gravel. A few areas are severely eroded. Areas of included soils range from 1/4 acre to 3 acres.

In the spring this Danley soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is medium to rapid. Rock fragments, mostly shale, range from 3 to 15 percent in the surface layer. Depth to bedrock is usually 5 feet or more. Reaction ranges from strongly acid to slightly acid in the surface layer and from medium acid to neutral in the subsoil.

The seasonally perched water table, slope, and slow permeability limit suitability of this soil for many uses. Most areas are suitable for farming. Most of the acreage is in hay, pasture, or woodland. A few areas are cultivated or are idle.

This Danley soil is moderately suited to cultivated crops, but temporary seasonal wetness can delay early spring planting. Erosion is a serious hazard that can be controlled by keeping tillage to a minimum, using cover crops, stripcropping, tilling on the contour, and frequently including sod crops in the cropping system. Random subsurface drains to wetter included spots improve the use of many fields. This soil is suitable for most field crops grown in the county if good tilth and fertility levels are maintained and erosion is controlled.

Many areas are suitable for pasture, but grazing during wet periods and overgrazing should be avoided to maintain quality pasture.

The potential of this soil for wood crops is good. The hazard of trees uprooting during windstorms and limitations to the use of equipment are minor concerns. Seedlings should be planted in the spring when the soil is moist to prevent a high mortality. Placing logging trails on the contour reduces trail gullying and erosion.

The temporary seasonally high water table, slope, and slow permeability in the substratum are serious limitations for many urban uses of this Danley soil. Basements are often difficult to keep dry, but interceptor drains upslope will divert surface and subsurface water from the structure. Frost action is a hazard for roads and small buildings without basements. Erosion is a serious hazard on construction sites, but revegetating disturbed areas as soon as possible helps eliminate it.

This Danley soil is in capability subclass IIIe.

DaD—Danley silt loam, 15 to 25 percent slopes. This moderately steep soil is deep and moderately well drained. It formed in shaly glacial till deposits. This soil is on hillsides on till plains at the edge of the upland plateau and on some valley side slopes. Most areas of this soil are oblong or elongated and range from 3 to 40 acres or more.

Typically, this soil has a surface layer of dark grayish brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is 26 inches thick. The upper 16 inches is dark brown silty clay loam, and the lower part is mottled, olive silty clay loam. The substratum to a depth of 60 inches or more is mottled, grayish brown shaly clay loam.

Included with this soil in mapping are small areas of the sloping Danley soils and soils that are similar to this Danley soil but are steep. Also included are small areas of the Darien and Aurora soils. The somewhat poorly drained Darien soils are on foot slopes and along drainageways, and the Aurora soils are underlain by bedrock at a depth of 20 to 40 inches. Some areas are severely eroded, and a few areas are more red than is typical for the Danley soils. In some small areas, this Danley soil is covered by a very thin layer of sand or gravel. Areas of included soils range from 1/4 acre to 3 acres.

In the spring this Danley soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is rapid. Rock fragments, mostly shale, range from 3 to 15 percent in the surface layer. Depth to bedrock is usually 5 feet or more. Reaction ranges from strongly acid to slightly acid in the surface layer and from medium acid to neutral in the subsoil.

Because of slope, the seasonally perched water table, and slow permeability, this soil is poorly suited to many uses. Most of the acreage is in woodland, or it is idle. A few areas of this soil are in hay crops, and some areas are pastured.

This Danley soil is poorly suited to cultivated crops because of the moderately steep slopes and associated erosion hazard. Erosion is a very serious hazard in cultivated areas, but it can be controlled by keeping tillage to a minimum, using cover crops, stripcropping, tilling on the contour, and frequently including sod crops in the cropping system. Equipment is somewhat difficult to use because of the moderately steep slopes.

Many areas are better suited to hay crops or pasture than to cultivated crops. Grazing during wet periods and overgrazing should be avoided to maintain quality pasture seedings. Overgrazing can also increase the erosion hazard.

The potential of this soil for wood crops is good. Equipment use is somewhat difficult because of the moderately steep slopes. Planting in the spring when the soil is moist helps prevent a high seedling mortality. Placing logging trails on the contour reduces trail gullying and erosion.

Slope, temporary seasonally high water table, and slow permeability in the substratum seriously limit this soil for most urban uses. Basements are often difficult to keep dry, but interceptor drains upslope reduce the wetness by diverting surface and subsurface water from around the structure. Frost action is a hazard for roads. Erosion is a very serious hazard in areas that are disturbed during construction, and revegetating these areas as soon as possible reduces it.

This Danley soil is in capability subclass IVe.

DbA—Darien silt loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in shaly glacial till deposits, mainly in an east-west band across the central part of the county. The landscape is nearly flat benches, broad hilltops, concave toe slopes, and level parts of rolling till plains. Most areas are elongated or roughly oblong and range from 5 to 200 acres or more.

Typically, this soil has a surface layer of dark grayish brown silt loam 10 inches thick. The subsurface layer is mottled, grayish brown silt loam 3 inches thick. The subsoil is 21 inches thick. It is mottled, olive brown silty clay loam in the upper part and mottled, dark grayish brown silty clay loam in the lower part. The substratum to a depth of 60 inches or more is firm, dark grayish brown shaly silty clay loam.

Included with this soil in mapping are small areas of the moderately deep Angola soils and the more acid Derb soils. Also included are areas of the poorly drained Ilion soils in depressions and along drainageways, a few small areas of the Erie soils that have a fragipan, and some areas where the surface layer is gravelly or shaly. Areas of included soils range from 1/4 acre to 2 acres.

In the winter and spring this Darien soil has a perched seasonal high water table in the upper part of the subsoil, which limits the rooting zone. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is slow. Rock fragments, mainly shale, make up 5 to 15 percent of the surface layer. The soil is medium acid to neutral in the surface layer and slightly acid or neutral in the subsoil.

This soil is moderately suited to farming, but seasonal wetness is a limitation for many crops. It is also a limitation for urban use. Most of the acreage is in hay or pasture, and some areas are idle.

This Darien soil is suitable for cultivated crops, if properly drained. Subsurface drains require fairly close spacing to be effective because water moves moderately slowly through the subsoil. Maintaining tilth can be a problem if cultivated crops are grown intensively. Keeping tillage to a minimum, using cover crops, and including sod crops in the cropping system promote good tilth and increase organic matter content.

Although some late-planted crops can be grown in undrained areas, most areas that are not drained are better suited to wetness-tolerant varieties of hay and pasture plants. To maintain high quality pasture, overgrazing and grazing during wet periods should be avoided. Grazing while the soil is wet causes trampling and the loss of the pasture plants.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of equipment on this soil, increases seedling mortality, and restricts rooting depth, which causes uprooting of trees during windstorms.

The seasonal high water table, high risk of frost damage, and slow permeability in the substratum are serious limitations for most urban uses of this soil. Because of the nearly level slope, sites for dwellings and other structures need grading and landscaping for proper runoff of surface water. Subsurface drains around foundations minimize the hazards associated with the seasonal high water table and reduce the danger of damage from frost action. Some areas are good sites for dugout ponds.

This Darien soil is in capability subclass IIIw.

DbB—Darien silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in shaly glacial till deposits, mainly in an east-west band across the central part of the county. The landscape is broad hilltops, concave toe slopes, and low, undulating parts of till plains. Most areas are elongated and range from 5 to 150 acres or more.

Typically, this soil has a surface layer of dark grayish brown silt loam 10 inches thick. The subsurface layer is mottled, grayish brown silt loam 3 inches thick. The subsoil is 21 inches thick. It is mottled, olive brown silty clay loam in the upper part and mottled, dark grayish brown silty clay loam in the lower part. The substratum to a depth of 60 inches or more is firm, dark grayish brown shaly silty clay loam.

Included with this soil in mapping are small areas of the moderately deep Angola soils and the more acid Derb soils. Also included are areas of the poorly drained Ilion soils in depressions, on toe slopes, and along drainageways; a few small areas of a soil that is similar to the Darien soil but has less clay in its subsoil; and some areas where the surface layer is gravelly or shaly. Areas of included soils range from 1/4 acre to 3 acres.

In the winter and spring this Darien soil has a perched seasonal high water table in the upper part of the subsoil, which limits the rooting zone. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is medium. Rock fragments, mainly shale, make up 5 to 15 percent of the surface layer. Bedrock is at a depth of 5 feet or more. The soil is medium acid to neutral in the surface layer and slightly acid or neutral in the subsoil.

This soil is moderately suited to farming, but seasonal wetness is a limitation for many crops. It is also a limitation for urban uses. Most of the acreage is in hay or pasture. Some areas of this soil are idle, and a few areas are wooded.

This Darien soil is suitable for cultivated crops, if properly drained. Subsurface drains require fairly close spacing to be effective because water moves moderately slowly through the subsoil. Interceptor drains that divert runoff and subsurface seepage from higher adjacent soils are beneficial in many areas. If cultivated crops are grown intensively, maintaining tilth can be a problem and erosion is a hazard. Keeping tillage to a minimum, using cover crops, tilling on the contour, and including sod crops in the cropping system help promote good tilth and increase organic matter content.

Although some late-planted crops can be grown, most areas that are not drained are better suited to wetness-tolerant varieties of hay and pasture plants. To maintain high quality pasture, overgrazing and grazing during wet periods should be avoided. Grazing while the soil is wet causes trampling and the loss of the pasture plants.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of equipment on the soil, increases seedling mortality, and restricts rooting depth, which causes uprooting of trees during windstorms. Placing logging trails across the slope reduces the hazard of trail gullying and erosion.

The seasonal high water table, high risk of frost damage, and slow permeability in the substratum are serious limitations for most urban uses of this soil. Interceptor drains that divert runoff and seepage from higher adjacent soils minimize the hazard of wetness around dwellings and other structures. Drains around foundations also minimize the problems caused by the seasonal high water table and reduce the danger of damage from frost action. Some areas are good sites for ponds.

This Darien soil is in capability subclass IIIw.

DbC—Darien silt loam, 8 to 15 percent slopes. This sloping soil is deep and somewhat poorly drained. It formed in shaly glacial till deposits, mainly in the central and southern part of the county. Most areas of this soil are on hillsides, bench fronts, side slopes of dissecting drainageways, and on rolling till plains. Most areas of this soil are elongated or oblong and range from 5 to 50 acres or more.

Typically, this soil has a surface layer of dark grayish brown silt loam 10 inches thick. The subsurface layer is mottled, grayish brown silt loam 3 inches thick. The subsoil is 21 inches thick. It is mottled, olive brown silty clay loam in the upper part and mottled, dark grayish brown silty clay loam in the lower part. The substratum to a depth of 60 inches or more is firm, dark grayish brown shaly silty clay loam.

Included with this soil in mapping are small areas of the moderately deep Angola soils and the more acid Derb soils. Also included are a few areas of the poorly drained Ilion soils in depressions and along drainageways. In some severely eroded areas much of the surface layer has been lost, and in some areas it is gravelly or shaly. Areas of included soils range from 1/4 acre to 3 acres.

In the winter and spring this Darien soil has a perched seasonal high water table in the upper part of the subsoil, which limits the rooting zone. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is medium to rapid. Rock fragments, mainly shale, make up 5 to 15 percent of the surface layer. Bedrock is at a depth of 5 feet or more. The soil is medium acid to neutral in the surface layer and slightly acid or neutral in the subsoil.

The soil can be used for farming, but seasonal wetness is a limitation for many crops. Seasonal wetness and slope are limitations for urban uses. Most of the acreage is in woodland, hay, or pasture, or it is idle.

This Darien soil can be used for cultivated crops if properly drained and protected from erosion. Erosion is a very serious hazard in intensively cultivated areas. Interceptor drains that divert runoff and seepage from higher adjacent soils allow for earlier tillage. Maintaining tilth can be a problem in cultivated areas. Keeping tillage to a minimum, stripcropping, using cover crops, tilling on the contour, and frequently including sod crops in the cropping system help promote good tilth, control erosion, and increase organic matter content. Tilling at the proper soil moisture content is also important for maintaining good tilth.

Although some late-planted crops can be grown in undrained areas, they are generally better suited to wetness-tolerant varieties of hay and pasture plants. To maintain high quality pasture, overgrazing and grazing during wet periods should be avoided. Grazing while the soil is wet causes trampling and the loss of the pasture plants. If forage cover becomes sparse through grazing, the hazard of erosion is increased.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of equipment on this soil, increases seedling mortality, and restricts rooting depth, which causes uprooting of trees during windstorms. Placing logging trails across the slope reduces the hazard of trail gullying and erosion.

The seasonal high water table, slope, danger of high frost action damage, and slow permeability in the substratum are serious limitations for most urban uses of this soil. Interceptor drains that divert runoff and seepage from higher adjacent soils and drains around foundations minimize the hazards associated with seasonal wetness. Erosion is a serious hazard on construction sites but can be controlled by revegetating the site as soon as possible. Roads and parking lots are subject to heaving because of the high frost action.

This Darien soil is in capability subclass IIIe.

DcB—Darien silt loam, silty substratum, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in shaly glacial till deposits in undulating areas that are underlain by silty lake-laid sediments. Most areas are along valley sides that were once part of glacial lakes. Areas of this soil are irregular in shape and range from 5 to 100 acres or more.

Typically, this soil has a surface layer of dark grayish brown silt loam 10 inches thick. The subsurface layer is mottled, grayish brown silt loam 3 inches thick. The subsoil is 19 inches thick. It is mottled, olive brown silty clay loam in the upper part and mottled, dark grayish brown silty clay loam in the lower part. The substratum to a depth of 48 inches is firm, dark grayish brown shaly silty clay loam, and below that it is brown silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Danley soils and of the Langford soils that have a fragipan in the subsoil. Also included are the poorly drained Ilion soils in a few depressional areas, on toe slopes, and along drainageways; the Canadice soils that have a clayey subsoil; and some areas where the surface layer is gravelly or shaly. Areas of included soils range from 1/4 acre to 3 acres.

In the winter and spring this Darien soil has a perched seasonal high water table in the upper part of the subsoil, which limits the rooting zone. Permeability is moderately slow in the subsoil and upper part of the substratum and slow in the lower part of the substratum. The available water capacity is moderate to high, and runoff is medium. Rock fragments, mainly shale, make up 5 to 15 percent of the surface layer. Bedrock is at a depth of 5 feet or more. The soil is medium acid to neutral in the surface layer and slightly acid or neutral in the subsoil.

The soil is moderately suited to farming, but seasonal wetness is a limitation for many crops. Seasonal wetness is also a limitation for urban uses. Most of the acreage is in hay or pasture, some areas are idle, and a few areas are wooded.

This Darien soil is suitable for cultivated crops, if properly drained. Subsurface drains require fairly close spacing to be effective because water moves moderately slowly through the subsoil. Interceptor drains are beneficial in some areas for diverting runoff and seepage from higher adjacent soils. If crops are intensively cultivated, maintaining tilth can be difficult and erosion is a hazard. Keeping tillage to a minimum, using cover crops, tilling across the slope, and including sod crops in the cropping system help promote good tilth, control erosion, and increase organic matter content.

Although some late-planted crops can be grown in undrained areas, such areas are generally better suited to wetness-tolerant varieties of hay and pasture plants. To maintain high quality pasture, grazing during wet periods should be avoided. Grazing while the soil is wet causes compaction and trampling of the soil and the loss of the pasture plants.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of equipment, increases seedling mortality, and restricts rooting depth, which causes uprooting of trees during windstorms. Placing logging trails across the slope reduces any hazard of trail gullying and erosion.

The seasonal high water table, danger of high frost damage potential, and slow permeability and silty texture in the substratum are serious limitations for most urban uses of this soil. Drains around foundations and interceptor drains that divert runoff from higher adjacent soils minimize the hazard of seasonal wetness around foundations. Drains also reduce the hazard of frost heaving of roads and structures without basements. Because of the silty substratum, this soil tends to be more unstable than other Darien soils. Excavations and cuts in foot slopes tend to slump or slide.

This Darien soil is in capability subclass IIIw.

DdA—Derb silt loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in silty glacial till deposits. This soil is on upland glacial till plains and glaciated dissected plateaus. Areas of this soil are irregular in shape and range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of dark grayish brown silt loam about 6 inches thick. The subsoil extends to a depth of 38 inches. It is mottled, brown silt loam in the upper part; mottled, brown silty clay loam in the middle part; and mottled, olive silty clay loam in the lower part. The substratum to a depth of 60 inches or more is mottled, olive silty clay loam.

Included with this soil in mapping are small intermingled areas of 3 acres or less of the Orpark and Hornell soils. The Orpark soils are underlain by bedrock at a depth of 20 to 40 inches, and the Hornell soils have a very high clay content in the subsoil. Also included are sizable areas of an unnamed soil that is similar to the Derb soil but has more sand in the subsoil.

From November through May this Derb soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is moderate or moderately slow in the subsoil and slow in the substratum. The available water capacity is high, and runoff is slow. Shale fragments make up 10 percent or less of the surface layer and subsoil. Bedrock is as shallow as 40 inches in some areas. In unlimed areas, the surface layer and subsoil are strongly acid or very strongly acid.

Seasonal wetness limits the suitability of this soil for farming and urban uses. Most areas are used for hay, pasture, or woodland. Some areas of this soil are idle.

This Derb soil is not well suited to most cultivated crops, unless drained. Seasonal wetness can be overcome by subsurface drainage where adequate outlets are available. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling at the proper soil moisture content, and rotating crops help promote good tilth, which deteriorates under intensive cultivation. This soil responds very well to liberal applications of lime and fertilizer.

Hay and pasture plants that can withstand seasonal wetness do well, particularly if this soil is adequately limed. Overgrazing and grazing when the soil is wet are major concerns of pasture management because they restrict plant growth and can cause the loss of the pasture seeding. Grazing when the soil is wet also leads to compaction and puddling of the soil.

The potential of this soil for wood crops is fair. Erosion is not a hazard, but seasonal wetness limits equipment use on this soil, increases seedling mortality, and restricts rooting depth, which causes uprooting of trees during windstorms.

Seasonal wetness, slow permeability in the substratum, and frost action damage are serious limitations for most urban uses of this soil. Grading and landscaping are important for removal of surface runoff around structures. Lawns and gardens usually require liberal applications of lime because the soil is very acid. Where bedrock is close to a depth of 40 inches, excavation is difficult.

This Derb soil is in capability subclass IIIw.

DdB—Derb silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in silty glacial till deposits. This soil is on undulating glacial till plains and dissected upland plateaus. Areas of this soil are irregular in shape and range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of dark grayish brown silt loam about 6 inches thick. The subsoil, which extends to a depth of 38 inches, is mottled, brown silt loam in the upper part; mottled, brown silty clay loam in the middle part; and mottled, olive silty clay loam in the lower part. The substratum to a depth of 60 inches or more is mottled, olive silty clay loam.

Included with this soil in mapping are small intermingled areas of 3 acres or less of the Orpark and Hornell soils. The Orpark soils are underlain by bedrock at a depth of 20 to 40 inches. The Hornell soils have a very high clay content in the subsoil. Also included are sizable areas of an unnamed soil that is similar to the Derb soil but has more sand and shale fragments in the subsoil.

From November through May this Derb soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is moderate or moderately slow in the subsoil and slow in the substratum. The available water capacity is high, and runoff is slow. Shale fragments make up 10 percent or less of the surface layer and subsoil. Bedrock is as shallow as 40 inches in some areas. In unlimed areas, the surface layer and subsoil are strongly acid or very strongly acid.

Seasonal wetness is a limitation to farming and urban uses of this soil. Most areas of this soil are used for hay, pasture, or woodland, and some areas are idle.

This Derb soil is not well suited to most cultivated crops, unless drained. Seasonal wetness can be overcome by subsurface drainage where adequate outlets are available. Erosion is a moderate hazard where the soil is cultivated. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling at the proper soil moisture content, tilling across the slope, and rotating crops help promote good tilth and reduce the hazard of erosion.

Hay and pasture plants that can withstand seasonal wetness do well, particularly if this soil is adequately limed. Overgrazing and grazing when the soil is wet are major concerns of pasture management because they restrict plant growth and can lead to the loss of the pasture seeding. Grazing when the soil is wet also causes compaction and puddling.

The potential of this soil for wood crops is fair. Erosion is usually not a hazard, but seasonal wetness limits equipment use on this soil, increases seedling mortality, and restricts rooting depth, which causes uprooting of trees during windstorms.

Seasonal wetness, slow permeability in the substratum, and high risk of frost damage are serious limitations for most urban uses of this soil. Grading and landscaping are important for removal of surface runoff around structures, and placing interceptor drains upslope helps divert subsurface seepage. Lawns and gardens usually require liberal applications of lime because the soil is very acid. Where bedrock is near a depth of 40 inches, excavation is difficult.

This Derb soil is in capability subclass IIIw.

DdC—Derb silt loam, 8 to 15 percent slopes. This sloping soil is deep and somewhat poorly drained. It formed in silty glacial till deposits. This soil is on rolling glacial till plains and on dissected side slopes and valley sides on the upland plateau. This soil commonly receives runoff from higher adjacent soils. Areas of this soil are oblong or irregular in shape and range from 3 to 80 acres, but areas of 5 to 40 acres are most common.

Typically, this soil has a surface layer of dark grayish brown silt loam about 6 inches thick. The subsoil extends to a depth of 38 inches. It is mottled, brown silt loam in the upper part; mottled, brown silty clay loam in the middle part; and mottled, olive silty clay loam in the lower part. The substratum to a depth of 60 inches is mottled, olive silty clay loam.

Included with this soil in mapping are small intermingled areas of 3 acres or less of the Schuyler, Orpark, and Hornell soils. The moderately well drained Schuyler soils are higher and are moderately steep. The Orpark soils are underlain by bedrock at a depth of 20 to 40 inches. The Hornell soils have a very high clay content in the subsoil. Also included are sizable areas of an unnamed soil that is similar to the Derb soil but has more sand and shale fragments in the subsoil.

From November through May this Derb soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is moderate or moderately slow in the subsoil and slow in the substratum. The available water capacity is high, and runoff is medium. Shale fragments make up 10 percent or less of the surface layer and subsoil. Bedrock is as shallow as 40 inches below the surface in some areas. In unlimed areas, the surface layer and subsoil are strongly acid or very strongly acid.

Seasonal wetness and slope are limitations for farming and urban uses of this Derb soil. Most areas of this soil are in woodland or pasture or are idle.

This soil is poorly suited to most cultivated crops, unless drained. Interceptor drains that divert runoff and subsurface seepage make earlier cultivation of most fields possible. Erosion is a serious hazard on this silty soil. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling at the proper soil moisture content, tilling on the contour, stripcropping, and rotating crops help promote good tilth and reduce the erosion hazard.

Hay and pasture plants that can withstand seasonal wetness do well, particularly if this soil is adequately limed. Overgrazing and grazing when the soil is wet are major concerns of pasture management because they restrict plant growth and may lead to the loss of the pasture seeding. Grazing when the soil is wet also causes it to compact and puddle.

The potential of this soil for wood crops is fair. Seasonal wetness limits equipment use on this soil, increases seedling mortality, and restricts rooting depth, which causes uprooting of trees during windstorms. Placing logging trails across the slope reduces trail gullying and erosion.

The seasonal wetness, slow permeability in the substratum, high risk of frost damage, and slope are serious limitations for most urban uses of this soil. Interceptor drains that divert runoff and subsurface seepage reduce the wetness around foundations. Lawns and gardens usually require liberal applications of lime because the soil is very acid. Where bedrock is nearly 40 inches below the surface, excavation is difficult. Construction sites should be revegetated as soon as possible to minimize the serious erosion hazard.

This Derb soil is in capability subclass IIIe.

Dp—Dumps. This miscellaneous area consists mostly of excavations that are filled or to be filled with rubbish and debris. Some areas consist of piles of rubbish where the landscape has been only slightly altered by man. More commonly, landfills are made by removing the soil and subsequently dumping trash and refuse into the excavated area. The refuse is covered, partially covered, or mixed with earth material. These areas are usually 3 to 50 feet deep. The sides are steep, and rubbish, consisting mostly of garbage, trash, old tires, bottles, cans, slabs of asphalt, and discarded appliances, lines the pit floor. The depth of the refuse and amount of soil covering are quite variable.

Included in mapping are small pools of water on some pit floors. These areas are irregular in shape, depending on the topography and ownership boundaries. They range from 3 to 160 acres or more.

Dumps usually have no vegetation, but some dumps have scattered bushes, grass, and other plants if the cover material has not been disturbed for a long period. The degree of wetness on these sites varies from dry to ponded, depending on the type of soil deposited and the extent of grading.

The suitability of these areas for urban or recreational uses is quite variable. Often the sites have a pungent odor, poor stability, unsanitary effluent, and rodent infestations, which make them undesirable for these uses. Onsite investigation of each site is necessary to determine its reclamation value for other proposed uses. Some areas can be reclaimed for farming or woodland.

This map unit is not assigned a capability subclass.

Du—Dumps, slag. This miscellaneous unit consists of mounds of iron ore residue. These areas were created by the dumping of waste material from the steel mills located in the cities of Buffalo and Lackawanna. The depth of these deposits varies, but mostly ranges from 3 to 60 feet. In some areas the sides of mounds are steep, but in most areas they are gently sloping or sloping. Many of these slag piles have been formed and shaped by grading. Included in mapping are small pools of water. The areas are commonly irregular in shape, depending on the nature of the deposited material and ownership boundaries. They range from 50 to 100 acres or more.

This map unit, consisting of iron slag, usually has no vegetation, although some older areas have scattered bushes and grasses. The areas are usually quite droughty.

The suitability of these areas for urban, recreational, farming, and woodland uses is generally very poor. Onsite investigation is needed to determine the suitability and limitations for any proposed use.

This Dumps, slag, unit is not assigned a capability subclass.

Ed—Edwards muck. This level soil is very poorly drained. It formed in well decomposed organic material underlain by white marl at a depth of 16 to 49 inches. This soil is in basins and depressions. Areas of this soil are roughly oval and range from 3 to 50 acres, but areas of 5 to 10 acres are most common. Slope ranges from 0 to 3 percent but is mostly less than 1 percent.

Typically, this soil has a surface layer of dark reddish brown muck about 6 inches thick. The organic subsurface layer is black muck about 27 inches thick. The substratum to a depth of 50 inches is white marl that contains many shell fragments.

Included with this soil in mapping are small areas of muck more than 50 inches deep and muck deposits that are less than 16 inches thick. Also included is a soil with thin layers of sedimentary peat above the marl. Areas of included soils are 3 acres or less.

This Edwards soil has a water table at or near the surface from September through June, which restricts the rooting depth. Permeability is moderately slow to moderately rapid in the organic layers and variable in the marl. This soil is subject to flooding or ponding. The available water capacity is high, and runoff is very slow or ponded. Depth to bedrock is generally 5 feet or more. The organic surface and subsurface layers range from medium acid to mildly alkaline.

This soil is poorly suited to farming, unless drained. It is very poorly suited to most urban uses. Most of the acreage supports wetness-tolerant sedges, grasses, and brush. Many areas provide habitat for wetland wildlife. A few areas are drained and farmed.

This Edwards soil is well suited to vegetable crops and specialized crops if properly drained and protected from flooding. Drainage outlets are difficult to establish because of the low position of this soil on the landscape. If drainage outlets are available, a combination of open ditches and subsurface drains is often needed for adequate drainage. Keeping tillage to a minimum, using cover crops, tilling at the proper soil moisture level, and rotating crops help replenish some of the organic matter that is lost through oxidation. These practices and the planting of windbreaks help control wind erosion, which is a serious hazard in drained areas of this soil. Drainage systems, where the water level can be controlled, minimize subsidence of the muck and also help control wind erosion. The use of equipment with flotation tires and light weight equipment reduces the hazard of soil compaction and permits the soil to drain more rapidly. Crops such as lettuce, onions, and potatoes do well in adequately drained areas that are properly managed.

This soil is not suited to pasture. Because the organic material is readily punctured by animal hooves, seedings are easily trampled and destroyed.

The potential of this soil for wood crops is very poor. Prolonged wetness seriously limits equipment use on this soil, increases seedling mortality, and, by restricting rooting depth, causes uprooting of trees during windstorms.

Prolonged wetness, excess humus, frequent flooding or ponding, instability, and low soil strength also cause this organic soil to be unsuited to most urban uses. Many areas are well suited to the development of wetland wildlife habitat.

This Edwards soil is in capability subclass Vw.

ElA—Elnora loamy fine sand, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It formed in wind- or water-deposited sands. This soil is on broad flats of the lowland lake plain and in a few valleys. Areas of this soil are irregular in shape and range from 3 to 60 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown loamy fine sand about 4 inches thick. The subsoil, which extends to a depth of 24 inches, is strong brown loamy fine sand in the upper part and yellowish brown loamy fine sand in the middle and lower part. The substratum to a depth of 60 inches is mottled, pale brown fine sand in the upper part and mottled, grayish brown fine sand in the lower part.

Included with this soil in mapping are small intermingled areas of the Colonie, Arkport, and Galen soils. The Colonie soils are better drained than the Elnora soil and are on slightly higher knolls and benches. The well drained Arkport soils and moderately well drained Galen soils have bands or thin layers of increased clay content in the subsoil. Also included is an unnamed soil in small depressions that is similar to the Elnora soil but wetter. Areas of included soils are 3 acres or less.

From February through May this Elnora soil has a seasonal high water table in the lower part of the subsoil. Permeability is moderately rapid or rapid in the subsoil and rapid in the substratum. The available water capacity is low, and runoff is slow. Depth to bedrock is generally 5 feet or more. There are usually no small stones in the soil. In unlimed areas, the surface layer and subsoil are very strongly acid to slightly acid.

The suitability of this soil for most types of farming and for some urban uses is limited by very low natural fertility, low available water capacity, temporary seasonal high water table, and coarse sandy texture. Many areas of this soil are idle, some areas are farmed, and a few areas are urbanized.

This Elnora soil is not well suited to cultivated crops, unless irrigated. Adequately irrigated, this soil is well suited to high-value crops, such as vegetable or fruit crops. Keeping tillage to a minimum, using cover crops, returning crop residues to the soil, tilling at the proper soil moisture content, and including sod crops in the cropping system improve tilth and increase the organic matter content. Increasing the organic matter content improves the available water capacity of the soil. This gravel-free soil responds well to irrigation, particularly if liberally limed and fertilized to overcome the low natural fertility of the soil.

Hay and pasture plants can be grown, but yields are low because this soil tends to be droughty. Overgrazing during dry periods can cause the loss of the forage grasses. Proper stocking, restricting grazing in dry periods, adaquately liming and fertilizing the soil, and seeding drought-tolerant pasture plants improve the quality and quantity of pastures.

The potential of this soil for wood crops is fair. Only a small acreage is wooded. Seedling mortality is a major problem because the soil is droughty and has very low natural fertility. Seedlings should be planted early in the spring when the soil is moist. This gravel-free, sandy soil is well suited to machine planting of seedlings.

The suitability of this Elnora soil for many urban uses is limited by temporary seasonal wetness, rapid permeability in the substratum, and droughtiness in midsummer. If this soil is used for septic tank absorption fields, contamination of ground water is possible because the substratum is rapidly permeable. During construction or if the vegetation is removed, this sandy soil is subject to blowing. Sloughing and caving of the unstable sandy material is a problem in excavations. Frequent watering and fertilizing of the soil are necessary to maintain grass and shrubs.

This Elnora soil is in capability subclass IIIw.

ElB—Elnora loamy fine sand, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in wind- or water-deposited sands. This soil is in broad, undulating areas of the lowland lake plain and in dissected areas in a few valleys. Areas of this soil are irregular in shape and range from 3 to 75 acres, but areas of 5 to 25 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown loamy fine sand about 4 inches thick. The subsoil extends to a depth of 24 inches. It is strong brown loamy fine sand in the upper part and yellowish brown loamy fine sand in the lower part. The substratum to a depth of 60 inches is mottled, pale brown fine sand in the upper part and mottled, grayish brown fine sand in the lower part.

Included with this soil in mapping are small intermingled areas of the Colonie, Arkport, and Galen soils. The Colonie soils are better drained than the Elnora soil and are on slightly higher knolls and benches. The well drained Arkport soils and the moderately well drained Galen soils have bands or thin layers of increased clay content in the subsoil. Also included, in small depressions and along drainageways, is an unnamed soil that is similar to the Elnora soil but wetter. Areas of included soils are 3 acres or less.

From February through May this Elnora soil has a seasonal high water table in the lower part of the subsoil. Permeability is moderately rapid or rapid in the subsoil and rapid in the substratum. The available water capacity is low, and runoff is medium. Depth to bedrock is generally 5 feet or more. There are usually no small stones in the soil. In unlimed areas, the surface layer and subsoil are very strongly acid to slightly acid.

The suitability of this soil for most types of farming and for some urban uses is limited by very low natural fertility, low available water capacity, temporary seasonal high water table, and coarse sandy texture. Many areas of this soil are idle, some areas are used in farming, and a few areas are urbanized.

This Elnora soil is not well suited to cultivated crops, unless irrigated. Adequately irrigated, this soil is well suited to high-value crops, such as vegetable or fruit crops. Erosion is a moderate hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, tilling on the contour, returning crop residues to the soil, tilling at the proper soil moisture content, and including sod crops in the cropping system improve tilth, help control erosion, and increase the organic matter content. Increasing the organic matter content improves the available water capacity of the soil. It is somewhat more difficult to manage irrigation systems on this soil than on the nearly level Elnora soil. Liberal applications of lime and fertilizer are needed to overcome the low natural fertility of the soil. Temporary wetness in the spring can delay normal planting.

Hay and pasture can be grown, but yields are often low because the soil tends to be droughty. Overgrazing during dry periods can cause the loss of the forage grasses. Proper stocking, restricting grazing in dry periods, adequately liming and fertilizing the soil, and seeding drought-tolerant pasture plants improve the quality and quantity of pastures.

The potential of this soil for wood crops is fair. Only a small acreage is wooded. Seedling mortality is a major problem because the soil is droughty and has very low natural fertility. Seedlings should be planted early in the spring when the soil is moist. This gravel-free, sandy soil is well suited to machine planting of seedlings.

The suitability of this Elnora soil for many urban uses is limited by temporary seasonal wetness, rapid permeability in the substratum, and droughtiness in midsummer. If this soil is used for septic tank absorption fields, contamination of ground water is possible because the substratum is rapidly permeable. During construction or where the vegetation is removed, this sandy soil is subject to blowing and water erosion. Sloughing and caving of the unstable sandy material is a problem in excavations. Frequent watering and fertilizing are necessary to maintain grass and shrubs.

This Elnora soil is in capability subclass IIIw.

ErA—Erie channery silt loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in glacial till deposits. A dense fragipan is in the lower part of the subsoil. This soil is on broad flats of upland till plains. Some areas receive runoff from adjacent soils. Areas of this soil are irregular in shape and range from 3 to 60 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown channery silt loam about 9 inches thick. The subsoil extends to a depth of about 40 inches. The upper part is mottled, pale brown channery silt loam about 5 inches thick, and the lower part is a fragipan of mottled, dark grayish brown channery silt loam. The substratum to a depth of 60 inches is mottled, dark grayish brown channery silt loam.

Included with this soil in mapping are small intermingled areas of the Chippewa, Langford, Mardin, and Volusia soils. The poorly drained Chippewa soils are in low depressional areas and along drainageways. The Langford soils are on higher, better drained knolls and ridges. The moderately well drained Mardin soils and the somewhat poorly drained Volusia soils are similar to this Erie soil but are more acid and have a slightly higher clay content in the fragipan. Areas of included soils range from a 1/4 acre to 3 acres.

This Erie soil has a perched seasonal high water table above the dense fragipan in the winter and spring. Rooting depth is restricted by the fragipan. Permeability is moderate above the fragipan and very slow or slow in the fragipan. The available water capacity is low, and runoff is slow. Channery fragments make up 15 to 35 percent of the surface layer. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer is very strongly acid to medium acid.

This soil is moderately suited to farming, if drained. It is poorly suited to most urban uses. Most of the acreage is in hay, pasture, or woodland, or it is idle. A few areas are urbanized or in cultivated crops.

This Erie soil can be used for cultivated crops but is often better suited to hay or pasture. Except where drained, seasonal wetness delays planting in the spring and hinders harvesting in the fall. This soil is difficult to drain because water moves slowly through the fragipan and many areas do not have suitable outlets. A combination of subsurface and surface drains is often essential for adequate drainage. Subsurface drains may require backfilling with gravel to be effective. This soil is somewhat harder to drain than the more sloping Erie soil. Flat channery fragments are bothersome when planting some crops, and they increase the rate of wear of equipment. Keeping tillage to a minimum, using cover crops, and including sod crops in the cropping system help preserve good tilth and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. Because the fragipan restricts rooting depth, droughtiness is a problem in midsummer in some years.

This soil is fairly well suited to pasture. Grazing when the soil is wet is the main management concern because it causes soil compaction and trampling of pasture plants. Rotational grazing, proper stocking, liming and fertilizing, and restricting grazing when the soil is wet help maintain pastures.

The potential of this soil for wood crops is fair to good. Windthrow and seedling mortality are minor hazards because of restricted rooting depth. Seasonal wetness can be a problem for machine planting of seedlings in the spring.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for most urban and recreational uses of this soil. Many areas are good sites for ponds or development of wildlife marshes.

This Erie soil is in capability subclass IIIw.

ErB—Erie channery silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in glacial till deposits and has dense fragipan in the lower part of the subsoil. It is on upland till plains in areas that commonly receive runoff from surrounding adjacent soils. Areas of this soil are irregular in shape and range from 3 to 60 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown channery silt loam about 9 inches thick. The subsoil is about 31 inches thick. The upper part of the subsoil is mottled, pale brown channery silt loam about 5 inches thick, and the lower part is a fragipan of mottled, dark grayish brown channery silt loam. The substratum to a depth of 60 inches is mottled, dark grayish brown channery silt loam.

Included with this soil in mapping are small intermingled areas of the Chippewa, Langford, Mardin, and Volusia soils. The poorly drained Chippewa soils are in low depressions and along drainageways. The Langford soils are on higher, better drained knolls and ridges. The moderately well drained Mardin soils and the somewhat poorly drained Volusia soils are similar to this Erie soil but are more acid and have a slightly higher clay content in the fragipan. Areas of included soils range from 1/4 acre to 3 acres.

This Erie soil has a perched seasonal high water table above the dense fragipan in the winter and spring. Rooting depth is restricted by the fragipan. Permeability is moderate above the fragipan and very slow or slow in the fragipan. The available water capacity is low. Channery fragments make up 15 to 35 percent of the surface layer. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer is very strongly acid to medium acid.

This soil is moderately suited to farming, if drained. It is poorly suited to most urban uses. Most of the acreage is in hay, pasture, or woodland, or it is idle. A few areas of this soil are urbanized, and some areas are in cultivated crops.

This Erie soil can be used for cultivated crops but is better suited to hay or pasture. Unless the soil is drained, seasonal wetness delays planting in the spring and hinders harvesting in the fall. This soil is somewhat difficult to drain because water moves slowly 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. Flat channery fragments are bothersome in planting some crops, and they increase the rate of wear of machinery. Keeping tillage to a minimum, using cover crops, tilling across the slope, and including sod crops in the cropping system help preserve good tilth, control erosion, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. Because the fragipan restricts root penetration, droughtiness can be a problem in midsummer in some years.

This soil is fairly well suited to pasture. Grazing when the soil is wet is the main management concern, because it causes soil compaction and trampling of pasture plants. Rotational grazing, proper stocking, liming and fertilizing, and restricting grazing when the soil is wet help maintain the pasture seedings.

The potential of this soil for wood crops is fair to good. Windthrow and seedling mortality are minor hazards because of restricted rooting depth. Seasonal wetness can be a problem for machine planting of seedlings in the spring.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for most urban and recreational uses of this soil. Many areas are excellent sites for diked ponds.

This Erie soil is in capability subclass IIIw.

ErC—Erie channery silt loam, 8 to 15 percent slopes. This sloping soil is deep and somewhat poorly drained. It formed in glacial till deposits. A dense fragipan is in the lower part of the subsoil. This soil is on smooth side slopes of upland till plains in areas that commonly receive runoff from adjacent soils. Areas of this soil are elongated or irregular in shape and range from 3 to 30 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown channery silt loam about 9 inches thick. The subsoil is about 31 inches thick. The upper part is mottled, pale brown channery silt loam about 5 inches thick, and the lower part is a fragipan of mottled, dark grayish brown channery silt loam. The substratum to a depth of 60 inches is mottled, dark grayish brown channery silt loam.

Included with this soil in mapping are small intermingled areas of the Chippewa, Langford, Bath, and Mardin soils. The poorly drained Chippewa soils are on a few foot slopes and along some drainageways. The Langford and Bath soils are on higher, better drained knolls and ridges. The moderately well drained Mardin soils are similar to this Erie soil but are more acid, better drained, and have a slightly higher clay content in the fragipan. Areas of included soils range from a 1/4 acre to 3 acres.

This Erie soil has a perched seasonal high water table above the dense fragipan in the winter and spring. Rooting depth is restricted by the fragipan. Permeability is moderate above the fragipan and very slow or slow in the fragipan. The available water capacity is low, and runoff is rapid. Channery fragments make up 15 to 35 percent of the surface layer. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer is very strongly acid to medium acid.

This soil can be used for farming, if drained. It is poorly suited to most urban uses. Most of the acreage is in woodland or pasture, or it is idle. A few areas are urbanized.

This Erie soil can be used for cultivated crops but is better suited to hay or pasture. Erosion is a serious hazard on long slopes and in intensively cultivated areas. Unless the soil is drained, seasonal wetness delays planting in the spring and hinders harvesting in the fall. This soil is somewhat difficult to drain because water moves slowly through the fragipan and many areas do not have suitable outlets. A combination of subsurface drains, closely spaced, 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 less sloping Erie soils. Flat channery fragments are bothersome in planting some crops and increase the rate of wear of machinery. Keeping tillage to a minimum, using cover crops, tilling across slope, stripcropping, and frequently including sod crops in the cropping system help preserve good tilth, control erosion, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. Because the fragipan restricts root penetration, droughtiness can be a problem in midsummer in some years.

This soil is fairly well suited to pasture. Grazing when the soil is wet is the main management concern because it causes soil compaction and trampling of pasture plants. Rotational grazing, proper stocking, liming and fertilizing, and restricting grazing when the soil is wet help maintain pasture seedings.

The potential of this soil for wood crops is fair to good. Windthrow and seedling mortality are minor hazards because of the restricted rooting depth. Seasonal wetness can be a problem for machine planting of seedlings in the spring. Placing logging trails across the slope reduces the hazard of trail gullying.

Seasonal wetness, slope, and slow or very slow permeability in the fragipan are serious limitations for most urban and recreational uses of this soil. Channery fragments are bothersome for establishing and maintaining lawns and gardens and for some recreational uses. Some areas are sites for diked ponds.

This Erie soil is in capability subclass IIIe.

FaA—Farmington cherty loam, 0 to 3 percent slopes. This nearly level soil is shallow and well drained. It formed in glacial till deposits. Limestone bedrock is at a depth of 10 to 20 inches. This soil is on broad flats near the limestone escarpment at the edge of the upland plateau. Although most areas are relatively large, some areas are small and completely surrounded by other nearly level soils that are deeper to bedrock. Areas of this soil are oblong or irregular in shape and range from 5 to 200 acres.

Typically, this soil has a surface layer of very friable, very dark grayish brown cherty loam about 9 inches thick. The subsoil is friable, brown cherty loam about 7 inches thick. Grayish limestone bedrock is at a depth of 16 inches.

Included with this soil in mapping are areas of the very cherty Benson soils and the moderately deep Wassaic soils. In a few places there are outcrops and ledges of limestone bedrock. In some areas the soil is less than 10 inches thick. The somewhat poorly drained Newstead soils are included in some low areas and along a few drainageways. Areas of the included soils range from 1/4 acre to 2 acres.

Bedrock is at a depth of 10 to 20 inches in this Farmington soil. Rock fragments make up 15 to 35 percent of the surface layer and consist mostly of chert. Rooting depth is limited by the underlying bedrock. Permeability is moderate throughout the soil. The available water capacity is low or very low, and runoff is slow. In unlimed areas, reaction is strongly acid to slightly acid in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is poorly suited to farming and most urban uses. Some areas are suitable for industrial development. Most areas are idle or used for urban purposes. Some areas are used for pasture or hay crops.

This Farmington soil can be used for cultivated crops but is better suited to hay or pasture. Shallowness to bedrock and droughtiness are serious limitations for cultivated crops. This soil can be tilled early in the spring; therefore, early-season crops or short-season crops are desirable to avoid midsummer droughtiness. Cherty rock fragments and occasional rock outcrops cause problems in the planting of some crops and lead to more rapid wear of machinery. Returning crop residues to the soil, using cover crops, including sod crops in the cropping system, and keeping tillage to a minimum promote good tilth and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil.

Pasture grasses are suited to this soil, but droughtiness in midsummer retards growth. Proper stocking, rotational grazing, and restricting grazing when the soil is wet or extremely dry help maintain the pasture.

The potential of this soil for wood crops is fair to poor. Summer droughtiness retards growth of most woodland species. Seedling mortality and windthrow are serious hazards. Seedlings planted early in the spring when the soil is moist have a better chance for survival. Species that can withstand dry conditions are the best suited to this soil.

The suitability of this soil for urban uses is limited by the shallow depth to bedrock and droughtiness. Excavation is very difficult because of the hardness of the rock. Because of solution cavities in the bedrock, contamination of the ground water is a very serious hazard if the soil is used for septic tank absorption fields. Cherty fragments interfere with the establishment of lawns. Some areas are suitable for quarries or recreational trails. The underlying bedrock provides a strong foundation for large industrial buildings.

This Farmington soil is in capability subclass IIIs.

FaB—Farmington cherty loam, 3 to 8 percent slopes. This gently sloping soil is shallow and well drained. It formed in glacial till deposits. Limestone bedrock is at a depth of 10 to 20 inches. This soil is near the east-west trending limestone escarpment at the edge of the upland plateau. Areas of this soil are oblong and range from 3 to 50 acres.

Typically, this soil has a surface layer of very friable, very dark grayish brown cherty loam about 9 inches thick. The subsoil is friable, brown cherty loam 7 inches thick. Grayish limestone rock is at a depth of 16 inches.

Included with this soil in mapping are the very cherty Benson soils and the moderately deep Wassaic soils. Outcropping ledges of limestone bedrock occur in some places and are more numerous than on the nearly level Farmington soil. In some areas the soil is less than 10 inches thick. Areas of included soils and Rock outcrop range from 1/4 acre to 3 acres.

Bedrock is at a depth of 10 to 20 inches in this Farmington soil. Rock fragments make up 15 to 35 percent of the surface layer and consist mostly of chert. Rooting depth is limited by the underlying bedrock. Permeability is moderate throughout the soil. The available water capacity is low or very low, and runoff is medium. In unlimed areas, reaction is strongly acid to slightly acid in the surface layer and medium acid to mildly alkaline in the subsoil.

This soil is poorly suited to farming and most urban uses. Some areas are suitable for industrial development. Most areas of this soil are idle, but some areas are used for urban development. A few areas are in pasture or hay crops.

This Farmington soil can be used for cultivated crops but is better suited to hay or pasture. Shallowness to bedrock and droughtiness are serious limitations for cultivated crops. This soil can be tilled early in the spring; therefore, early-season crops or short-season crops are desirable to avoid midsummer droughtiness. Erosion is a hazard in intensively cropped areas. Cherty rock fragments and occasional rock outcrop cause problems in the planting of some crops and lead to more rapid wear of machinery. Returning crop residues to the soil, tilling across slope, using cover crops, including sod crops in the cropping system, and keeping tillage to a minimum help promote good tilth, control erosion, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil.

Pasture grasses are suited to this soil, but droughtiness in midsummer retards growth. Proper stocking, rotational grazing, and restricting grazing when the soil is wet or extremely dry help maintain the pasture. Forage plants that can withstand droughty soil conditions are best suited to this soil.

The potential of this soil for wood crops is fair to poor. Summer droughtiness retards the growth of most woodland species. Seedling mortality and windthrow are serious hazards. Seedlings planted early in the spring when the soil is moist have a better chance for survival. Plants that require dry sites are well suited to this soil.

The suitability of this soil for urban uses is limited by the shallow depth to bedrock and droughtiness. Excavation is very difficult because of the hardness of the underlying rock. Because of solution cavities in the bedrock, contamination of the ground water is a very serious threat where the soil is used for septic tank absorption fields. Cherty fragments interfere with the establishment of lawns. Frequent watering of lawns and shrubs is often needed during the drier summer months. Some areas are suitable for quarries or recreational trails.

This Farmington soil is in capability subclass IIIe.

FbA—Farnham shaly silt loam, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It is on terraces, glacial lake beaches, outwash plains, and recessional moraines. Areas are elongated on terraces and beaches and irregular in shape in other places. Areas of this soil range from 3 to 80 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown shaly silt loam about 7 inches thick. The subsoil is about 31 inches thick. It is dark brown shaly silt loam in the upper part grading to mottled, dark brown very shaly loam in the lower part. The substratum is grayish brown very shaly loam to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Blasdell, Chenango, Castile, and Red Hook soils. The Blasdell soils are similar to this Farnham soil but are better drained. The Chenango soils have a lower shale content and are also better drained, the Castile soils have a lower shale content, and the Red Hook soils are more poorly drained than the Farnham soil. Also included are areas of a soil that is similar to the Farnham soil but formed in shaly glacial till and has bedrock within 50 inches of the surface in many places. Areas of included soils range from 1/4 acre to 3 acres.

From January through May this Farnham soil has a seasonal high water table that rises into the lower part of the subsoil. Permeability is moderately rapid throughout the soil. The available water capacity is low to moderate, and runoff is slow. Shale fragments make up 15 to 35 percent of the surface layer. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suited to farming and some urban uses. If irrigation water is available, it is well suited to many crops. Most areas are used for cultivated crops, hay, or pasture. A few areas are urbanized, and a few are idle.

This Farnham soil is moderately suited to cultivated crops. The seasonal high water table, droughtiness in midsummer, and low natural fertility are the main limitations. Keeping tillage to a minimum, using cover crops, frequently applying fertilizer, incorporating crop residues into the soil, and including sod crops in the cropping system improve tilth and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. This soil is well suited to irrigation, and crop response is excellent where irrigation water is available.

It is also suited to pasture and hay. Grazing should be restricted during wet periods and in extremely dry periods to prevent the loss of the pasture plants. Liberal application of lime and fertilizer is needed for optimum production of hay and pasture.

Timber production on this soil is fair to good, but only a limited acreage is wooded. Planting early in the spring when the soil is moist minimizes seedling mortality. Machine planting of seedlings is practical in most areas.

The seasonal high water table and droughtiness in midsummer are limitations for most urban uses of this soil. Basements are difficult to keep dry because of the seasonal high water table early in the spring. Watering between summer rains and frequently fertilizing help maintain grass and shrubs. This soil is a poor source of topsoil because it has a high content of shale fragments. It is also a poor source of gravel because the shale fragments tend to be somewhat soft.

This Farnham soil is in capability subclass IIw.

FbB—Farnham shaly silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It is on terraces, glacial lake beaches, undulating outwash plains, and recessional moraines. Areas are elongated on terraces and beaches and irregular in shape in other places. Areas of this soil range from 3 to 80 acres but are more commonly 5 to 20 acres.

Typically, this soil has a surface layer of very dark grayish brown shaly silt loam about 7 inches thick. The subsoil is about 31 inches thick. It is dark brown shaly silt loam in the upper part grading to mottled, very shaly loam in the lower part. The substratum is grayish brown very shaly loam to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Blasdell, Chenango, Castile, and Red Hook soils. The Blasdell soils are similar to this Farnham soil but are better drained, the Chenango soils have a lower shale content and are also better drained, the Castile soils have a lower shale content, and the Red Hook soils are more poorly drained than the Farnham soil. Also included are areas of a soil that is similar to the Farnham soil but formed in shaly glacial till and has bedrock 50 inches of the surface in many places. Areas of included soils range from 1/4 acre to 3 acres.

From January through May this Farnham soil has a seasonal high water table that rises into the lower part of the subsoil. Permeability is moderately rapid throughout the soil. The available water capacity is low to moderate, and runoff is medium. Shale fragments make up 15 to 35 percent of the surface layer. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suited to farming and some urban uses. If irrigation water is available, it is well suited to many crops. Most areas are used for cultivated crops, hay, or pasture. A few areas are urbanized, wooded, or idle.

This Farnham soil is moderately suited to cultivated crops. The seasonal high water table, droughtiness in midsummer, and low natural fertility are the main limitations. Erosion is a moderate hazard, particularly on long slopes. Keeping tillage to a minimum, using cover crops, frequently applying fertilizer, incorporating crop residues into the soil, tilling on the contour, and including sod crops in the cropping system improve tilth, control erosion, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. This soil is well suited to irrigation, but irrigation systems are more difficult to manage on this soil than on the nearly level Farnham soil.

This soil is also suited to pasture and hay. Grazing should be restricted during wet periods and in extremely dry periods to prevent the loss of the pasture plants. Liberal applications of lime and fertilizer are needed for optimum production of hay and pasture.

Timber production on this soil is fair to good, but only a limited acreage is wooded. Planting early in the spring when the soil is moist minimizes seedling mortality. Machine planting of seedlings is practical in most areas.

The seasonal high water table and midsummer droughtiness are limitations for most urban uses of this soil. Basements are difficult to keep dry because of the seasonal high water table early in the spring. Watering between summer rains and frequently fertilizing the soil help maintain grass and shrubs. This soil is a poor source of topsoil because it has a high content of shale fragments. It is also a poor source of gravel because the shale fragments tend to be somewhat soft. Areas left bare of vegetative cover during construction are subject to serious erosion and should be vegetated as soon as possible.

This Farnham soil is in capability subclass IIw.

FcA—Farnham shaly silt loam, fan, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It is on alluvial fans. Most areas are triangular or fan shaped. They range from 3 to 50 acres, but are more commonly 5 to 30 acres.

Typically, this soil has a surface layer of very dark grayish brown shaly silt loam about 6 inches thick. The subsoil is about 40 inches thick. It is dark brown shaly silt loam in the upper part grading to mottled, very shaly loam in the lower part. The substratum is grayish brown very shaly loam to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Blasdell, Chenango, and Red Hook soils. The Blasdell soils are similar to this Farnham soil but are better drained, the Chenango soils have a lower shale content and are also better drained, and the somewhat poorly drained Red Hood soils are in low areas and on toe slopes. Included are a few areas of the gently sloping Farnham soils. The Wayland soils that are subject to frequent flooding are also included in a few small areas where the fan merges with the lower valley bottom. Areas of included soils range from 1/4 acre to 3 acres.

This Farnham soil is subject to rare flooding from small streams that traverse this unit. From January through May this soil has a seasonal high water table that rises into the lower part of the subsoil. Permeability is moderately rapid throughout the soil. The available water capacity is low to moderate, and runoff is slow. Shale fragments make up 15 to 35 percent of the surface layer. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suited to farming but poorly suited to most urban uses. If irrigation water is available, this soil is well suited to many crops. Most areas are used for cultivated crops, for hay, or for pasture. Some areas are wooded, and a few areas are idle.

This Farnham soil is suited to cultivated crops. The seasonal high water table, droughtiness in midsummer, and low natural fertility are the main limitations. Flooding usually occurs in the spring and is normally not a threat to crops. Keeping tillage to a minimum, using cover crops, frequently applying fertilizer, incorporating crop residues into the soil, and including sod crops in the cropping system improve tilth, prevent flood scour, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. This soil is well suited to irrigation, and crop response is excellent where irrigation water is available. Shale fragments are slightly bothersome in planting some crops and cause rapid wear of machinery.

This soil is also suited to pasture and hay. Grazing should be restricted during wet periods and extremely dry periods to prevent the loss of the pasture plants. Liberal application of lime and fertilizer is needed for optimum production of hay and pasture.

Timber production on this soil is fair to good. Planting early in the spring when the soil is moist minimizes seedling mortality. Machine planting of seedlings is practical in most areas.

The seasonal high water table, rare flooding, and droughtiness in midsummer are limitations for most urban uses of this soil. Basements are difficult to keep dry because of the seasonal high water table early in the spring. Watering between summer rains and frequently fertilizing help maintain lawns and shrubs. This soil is a poor source of topsoil because it has a high content of shale fragments. It is also a poor source of gravel because the shale fragments tend to be somewhat soft. Some areas are suitable for recreational uses such as picnic areas and playgrounds, but small stones can be bothersome.

This Farnham soil is in capability subclass IIw.

FcB—Farnham shaly silt loam, fan, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It is on alluvial fans. The areas are mostly triangular or fan shaped and range from 3 to 50 acres, but are more commonly 5 to 30 acres.

Typically, this soil has a surface layer of very dark grayish brown shaly silt loam about 6 inches thick. The subsoil is about 40 inches thick. It is dark brown shaly silt loam in the upper part grading to mottled, very shaly loam in the lower part. The substratum is grayish brown very shaly loam to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Blasdell, Chenango, and Red Hook soils. The Blasdell soils are similar to this Farnham soil but are better drained, the Chenango soils have a lower shale content and are also better drained, and the somewhat poorly drained Red Hook soils are in low areas on toe slopes and along drainageways. A few areas of Wayland soils, which are subject to frequent flooding, are where the fan merges with the valley bottom. A few areas are nearly level. Areas of included soils range from 1/4 acre to 3 acres.

This Farnham soil is subject to rare flooding from small streams. From January through May this soil has a seasonal high water table that moves laterally through the lower part of the subsoil. Permeability is moderately rapid throughout the soil. The available water capacity is low to moderate, and runoff is medium. Shale fragments make up 15 to 35 percent of the surface layer. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suited to farming but has limitations for most urban uses. If irrigation water is available, this soil is well suited to many crops. Most areas are used for cultivated crops, hay, or pasture. Some areas are wooded, and a few areas are idle.

This Farnham soil is suited to cultivated crops. The seasonal high water table, droughtiness in midsummer, erosion hazard, and low natural fertility are the main limitations. Erosion is a moderate problem, particularly on long slopes and in intensively cultivated areas. Flooding is usually not a problem for crop production, because it normally occurs in the spring before crops are planted. Keeping tillage to a minimum, using cover crops, frequently applying fertilizer, incorporating crop residues into the soil, tilling on the contour, and including sod crops in the cropping system improve tilth, control erosion, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. Some of these practices also reduce the hazard of scouring during flooding. This soil is well suited to irrigation, but irrigation systems are more difficult to manage on this soil than on the nearly level Farnham soils. Shale fragments are somewhat bothersome in planting fine-seeded crops.

This soil is suited to pasture and hay. Grazing should be restricted during wet periods and in extremely dry periods to prevent the loss of the pasture plants. Liberal applications of lime and fertilizer are needed for optimum production of hay and pasture.

Timber production on this soil is fair to good. Planting early in the spring when the soil is moist minimizes seedling mortality. Machine planting of seedlings is practical in most areas. Placing logging trails on the contour reduces the hazard of trail gullying.

The seasonal high water table, rare flooding, and droughtiness in midsummer are serious limitations for most urban uses of this soil. Basements are difficult to keep dry because of the lateral seeping high water table early in the spring. Watering between summer rains and frequently fertilizing the soil help maintain grass and shrubs. This soil is a poor source of topsoil because of the high content of shale fragments, and it is a poor source of gravel because the shale fragments tend to be somewhat soft. Areas that are left bare during construction are subject to erosion and should be revegetated as soon as possible. Small shale fragments are bothersome for some recreational uses.

This Farnham soil is in capability subclass IIw.

Fu—Fluvaquents and Udifluvents, frequently flooded. These are nearly level to gently sloping, poorly drained to well drained soils that formed in recent stream deposits. These soils consist mainly of silty, sandy, or loamy alluvial sediments and varying amounts of small stone fragments. They are subject to frequent flooding from nearby streams. Areas are mostly elongated, and they parallel the nearby streams and creeks. They range from 3 to 75 acres, but areas of 5 to 20 acres are most common. The soils in this map unit are classified above the series level because of the variability of their characteristics and properties.

Some areas of this map unit consist of Fluvaquents, other areas are mainly Udifluvents, and many areas include both of these soils. The Fluvaquents make up most of the total acreage.

Fluvaquents have a black, gray, or brown surface layer, 1 to 10 inches thick, that is loamy or silty and has varying amounts of shale, gravel, or cobblestones. The substratum is gray or brown material that is silty, sandy, or loamy and has varying amounts of shale, gravel, flagstones, or cobblestones. Bedrock is at a depth of 1-1/2 feet to 20 feet or more.

Udifluvents have a brown surface layer about 1 to 9 inches thick. It is sandy, silty, or loamy and has various amounts of gravel, shale, or cobblestones. The substratum is brown, red, or yellow and is composed of sandy, silty, or loamy deposits with varying amounts of shale, gravel, flagstones, and cobblestones. Bedrock is at a depth of 4 feet or more.

These Fluvaquents and Udifluvents are subject to frequent overflow from adjacent streams. Stream cutting and lateral erosion commonly shift the soil from place to place during flood periods. Fluvaquents are somewhat poorly drained or poorly drained, and the Udifluvents are well drained or moderately well drained. Permeability, available water capacity, content of small stones, and acidity are quite variable in these soils.

Most areas of this map unit are in brush. A few areas have been cleared and are used for pasture.

Onsite investigation of individual areas is needed to determine the feasibility for most uses. Because of frequent flooding, however, these soils are usually poorly suited to farming, recreational uses, and urban uses. Some areas can be used for pasture, but scour channels, short steep embankments, and uneven topography make reseeding or applying fertilizer very difficult. Some areas are suitable for woodland, but timber growth is usually slow. Other areas provide habitat or nesting areas for wetland wildlife.

These Fluvaquents and Udifluvents are in capability subclass Vw.

GaA—Galen very fine sandy loam, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It is on broad flat areas of remnant deltas and beaches of former glacial lakes. These areas are elongated to irregular in shape and range from 3 to 100 acres, but most areas are smaller than 40 acres. In the southern part of the county, this soil is in smaller areas of 3 to 30 acres.

Typically, this soil has a surface layer of dark brown very fine sandy loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is mottled, brownish yellow fine sandy loam; the middle part is mottled, brown loamy fine sand; and the bottom part is brown loamy fine sand with thin bands of dark yellowish brown fine sandy loam. The substratum is pale brown fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the gently sloping Galen soils and areas of the Minoa, Arkport, Elnora, and Claverack soils. The somewhat poorly drained Minoa soils are in small rounded depressions and along narrow drainageways. A few small areas of the well drained Arkport soils and the sandy Elnora soils are on slight rises or knolls. The substratum of the Claverack soils is mainly clay or silt. In some areas the Galen soil may have one or two horizontal bands, up to 10 inches thick, of silty material in the subsoil. Areas of included soils range from 1/2 acre to 2 acres.

In the spring this Galen soil has a seasonal high water table about 1-1/2 to 2 feet below the surface. Permeability is moderate in the subsoil and moderately rapid in the substratum. Slowly permeable layers can be in the substratum below a depth of 5 feet. The available water capacity is moderate, and runoff is slow. Depth to bedrock is 5 feet or more, and there are generally no rock fragments in the soil. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to neutral in the subsoil.

This soil is suitable for farming and moderately suited to some urban uses. Most of the acreage is cultivated, is in hay or pasture, or is wooded. Some areas are idle, and a few areas are urbanized.

This Galen soil is suited to most cultivated crops and is well suited to hay or pasture. Temporary spring wetness can delay planting of some crops. Water erosion is usually not a problem on this nearly level soil, except where open ditches are unprotected. Soil blowing can occur in intensively cultivated areas during dry periods. Keeping tillage to a minimum, using cover crops, and including sod crops in the cropping system help promote good tilth, increase organic matter content, and improve crop yields. Installing artificial drainage is difficult because of the nearly level slopes and the instability of cut banks. However, with adequate drainage of wet spots and maintenance of tilth and fertility, this gravel-free soil is suitable for most crops grown in the county and is especially well suited to vegetable and certain fruit crops. Some crops may need irrigation in dry periods. This soil is not suitable for irrigation ponds because of its moderate seepage rate. Overgrazing and grazing when the soil is wet are the major concerns of pasture management, because they can cause the loss of the pasture grasses.

The potential of this soil for wood crops is good. There are few limitations for managing woodland stands on this soil.

The temporary seasonal wetness, instability of cut banks, moderate risk of frost damage, and moderate seepage are limitations for some urban uses of this Galen soil. Some areas are suitable for recreational uses, such as campsites, picnic areas, athletic fields, and other activities that require a nearly level, stone-free site. During excavation, the subsoil exposed in cut banks is erosive and unstable, especially if it is wet. Frequent fertilization helps maintain grass and shrubs. This soil is a good source of topsoil.

This Galen soil is in capability subclass IIw.

GaB—Galen very fine sandy loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It is on low ridges and side slopes adjacent to drainageways near broad flats of the nearly level Galen soils. These soils have a high sand content and formed in deltas and beaches of former glacial lakes. A few areas are associated with sandy glacial outwash deposits. Areas of this soil are elongated to irregular in shape and range from 3 to 40 acres.

Typically, this soil has a surface layer of dark brown very fine sandy loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is mottled, brownish yellow fine sandy loam; the middle part is mottled, brown loamy fine sand; and the bottom part is brown loamy fine sand with thin bands of dark yellowish brown fine sandy loam. The substratum to a depth of 60 inches or more is pale brown fine sand.

Included with this soil in mapping are small areas of the nearly level Galen soils and areas of the Minoa, Arkport, Elnora, Niagara, and Claverack soils. The somewhat poorly drained Minoa soils are in small rounded depressions and in the bottom of narrow drainageways. A few small areas of the well drained Arkport soils and the sandy Elnora soils are on slight rises or knolls. The Niagara soils are in slight depressions that are dominantly silty sediments. The Claverack soils are mainly clay or silt in the substratum. In some areas the Galen soil may have one or two horizontal bands of silty sediment about 10 inches thick in the subsoil. Areas of included soils range from 1/2 acre to 2 acres.

In the spring this Galen soil has a seasonal high water table about 1-1/2 to 2 feet below the surface. Permeability is moderate in the subsoil and moderately rapid in the substratum. Slowly permeable layers can be in the substratum below a depth of 5 feet. The available water capacity is moderate, and runoff is slow to medium. Depth to bedrock is 5 feet or more, and there are generally no small rock fragments in the soil. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to neutral in the subsoil.

This soil is suitable for farming and for some urban uses. Most of the acreage is cultivated, is in hay or pasture, or is wooded. Some areas of this soil are idle or are in urban development.

This Galen soil is suited to most cultivated crops and is well suited to hay or pasture. Temporary spring wetness can delay planting of some crops. Water erosion is a hazard on long slopes and in intensively cultivated areas. Open ditches need vegetative cover to prevent water and wind erosion. Keeping tillage to a minimum, using cover crops, tilling on the contour, and including sod crops in the cropping system help promote good tilth, control erosion, increase organic matter content, and improve crop yields. Subsurface drainage of wet spots improves the use of many fields. Installing drains can be somewhat difficult because the cut banks tend to cave or slump. If tilth and high fertility levels are maintained, this gravel-free soil is suited to most crops grown in the county, including some vegetable and fruit crops. Some crops need irrigation in dry periods; however, this soil is more difficult to irrigate than the nearly level Galen soil. Overgrazing and grazing when the soil is wet are the major concerns of pasture management because they can cause the loss of the pasture grasses.

The potential of this soil for wood crops is good. There are few limitations for managing woodland stands on this soil. Placing logging trails across the slope reduces any hazard of trail gullying or erosion.

The temporary seasonal wetness, instability of cut banks, moderate risk of frost damage, and moderate seepage are limitations for some urban uses of this Galen soil. Some areas are suitable for recreational uses, such as campsites and picnic areas. During excavation, the subsoil exposed in cut banks is erosive and unstable, especialy if it is wet. Revegetating disturbed areas as soon as possible helps eliminate these problems. Frequent fertilization helps maintain grass and shrubs. This soil is a good source of topsoil.

This Galen soil is in capability subclass IIw.

GbB—Galen fine sandy loam, till substratum, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It is on low ridges and sides of drainageways. This soil formed in glacial till mantled with sandy deltaic deposits. Most areas are on the lowland plain in the northern and western parts of the county. The underlying glacial till is at a depth of 3-1/2 to 5 feet. The areas are oblong or elongated and range from 3 to 40 acres.

Typically, this soil has a surface layer of dark brown fine sandy loam about 7 inches thick. The subsoil is about 33 inches thick. The upper part of the subsoil is mottled, brownish yellow fine sandy loam. The lower part is brown loamy fine sand with thin bands of dark yellowish brown fine sandy loam. The substratum to a depth of 60 inches or more is firm, brown gravelly loam.

Included with this soil in mapping are small areas of the nearly level Galen soils and areas of the Minoa and Arkport soils. The somewhat poorly drained Minoa soils are in small depressions and in the bottom of narrow drainageways, and the well drained Arkport soils are on a few slight rises or knolls. In some areas, the loamy glacial till deposits are at a depth of more than 5 feet or less than 3-1/2 feet. Areas of included soils range from 1/2 acre to 2 acres.

In the spring this Galen soil has a seasonal high water table in the lower part of the subsoil. Permeability is moderate in the subsoil and slow in the substratum. The available water capacity is moderate, and runoff is slow to medium. Depth to bedrock is more than 5 feet, and there are generally no small rock fragments except in the substratum. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to neutral in the subsoil.

This soil is suitable for farming and for some urban uses. Most of the acreage is cultivated, is in hay or pasture, or is wooded. Some areas are idle, and some are in urban development.

This Galen soil is suited to most cultivated crops and is well suited to hay or pasture. Temporary spring wetness can delay planting of some crops. Erosion is a hazard on long slopes and in intensively cultivated areas. Open ditches need vegetative cover to prevent water and wind erosion. Keeping tillage to a minimum, using cover crops, tilling on the contour, plowing at the proper soil moisture content, and including sod crops in the cropping system help promote good tilth, control erosion, increase organic matter content, and improve crop yields. Subsurface drainage of wet spots improves the use of many fields. Because of the slowly permeable substratum, this soil is more difficult to drain than the other Galen soils that do not have a glacial till substratum. If tilth and high fertility levels are maintained, this gravel-free soil is suited to most crops grown in the county, including some vegetable and fruit crops. Some crops need irrigation in dry periods; however, this soil is somewhat more difficult to irrigate than the nearly level Galen soil. Overgrazing and grazing when the soil is wet are the major concerns of pasture management because they can cause the loss of the pasture grasses.

The potential of this soil for wood crops is good. There are few limitations for managing woodland stands on this soil. Placing logging trails across the slope reduces the hazard of trail gullying or erosion.

The temporary seasonal wetness, slow permeability in the substratum, instability of cut banks, moderate risk of frost damage, and moderate seepage are limitations for some urban uses of this Galen soil. Some areas are suitable for recreational uses, such as campsites and picnic areas. During excavation, the subsoil exposed in cut banks is quite erosive and unstable, especially if the soil is wet. Revegetating disturbed areas as soon as possible helps eliminate these problems. Because this soil has a glacial till substratum, soil strength is somewhat better than in the other Galen soils.

This Galen soil is in capability subclass IIw.

Ge—Getzville silt loam. This level to nearly level soil is deep and poorly drained and very poorly drained. It is on lowland plains of former glacial lakes, mainly in the northern part of the county. This soil formed in silty deposits underlain by sandy sediments at a depth of 15 to 36 inches. Slope ranges from 0 to 3 percent. Areas of this soil are irregular in shape or are roughly elongated where they parallel major and minor streams. Individual areas range from 3 to 200 acres or more, but areas of 5 to 40 acres are most common.

Typically, this soil has a surface layer of dark grayish brown heavy silt loam about 8 inches thick. The subsoil extends to a depth of 24 inches. It is mottled, light brownish gray light silty clay loam in the upper part grading to silt loam in the lower part. The substratum to a depth of 60 inches or more is mottled, dark brown fine sand.

Included with this soil in mapping are small intermingled areas of the Swormville, Minoa, and Raynham soils. The Swormville soils are similar to this Getzville soil but are somewhat poorly drained and are on slightly higher benches. The Minoa soils have a high sand content. The Raynham soils are silty throughout the profile. Some areas have inclusions of the clayey Rhinebeck soils that have sandy deposits 40 inches or more below the surface. A few areas have a mucky surface layer. Areas of included soils range up to 3 acres.

This Getzville soil has a high water table at or near the surface from November through June. Permeability is moderate or moderately slow in the surface layer and subsoil and moderately rapid in the substratum. The available water capacity is moderate to high, and runoff is slow. There is usually no gravel in the surface layer and subsoil. Depth to bedrock is 5 feet or more. Reaction is strongly acid to neutral in the surface layer and medium acid to neutral in the subsoil.

The suitability of this soil for farm and urban uses is very limited by prolonged wetness. Most areas of this soil are in woodland, or they are idle. A few areas are used for pasture, and a few areas are drained and cultivated.

Because of prolonged wetness, this Getzville soil is poorly suited to cultivated crops, unless drained. Draining this soil can be difficult because of its low position on the landscape. Properly drained, this gravel-free soil is suited to many crops. Tilth and structure deteriorate if the soil is plowed when it is wet. In drained areas, keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling at the proper soil moisture level, and including sod crops in the cropping system help maintain tilth, increase organic matter content, and insure optimum crop yields. Because of the sandy substratum, drains do not have to be closely spaced.

This soil is suited to pasture if it is partially drained. Proper stocking, rotating crops, yearly mowing, and restricting grazing when the soil is wet are the main management needs. Grazing when the soil is wet causes compaction and puddling of the soil and the trampling of pasture plants, which reduce plant growth and can lead to the loss of pasture seeding.

Because of prolonged wetness, the potential of this soil for wood crops is poor. Wetness is a serious problem for the use of equipment. It also increases seedling mortality and limits the rooting depth of trees, which can cause them to uproot during windstorms. Seedlings that can withstand wet conditions are best suited to this soil.

The prolonged high water table, low soil strength, tendency of sidewalls of excavations to cave or slump, and high risk of frost damage very seriously limit urban uses of this soil. Overcoming the prolonged wetness is very difficult in most areas. Rare ponding or flooding is an additional hazard in a few areas. This soil is suited to dugout ponds, and most sites quickly refill if the water is used for irrigation. Many areas have excellent suitability for wildlife marshes.

This Getzville soil is in capability subclass IVw.

Ha—Halsey silt loam. This nearly level soil is deep and very poorly drained. It formed in gravelly glacial outwash deposits. This soil is in circular depressions on outwash plains and in oblong areas along drainageways and seep areas. Slope ranges from 0 to 3 percent. Areas of this soil range from 5 to 50 acres or more.

Typically, this soil has a surface layer of very friable, black silt loam about 8 inches thick. The subsoil is 17 inches thick. It is mottled, grayish brown gravelly silt loam in the upper part and mottled, gray very gravelly sandy loam in the lower part. The substratum to a depth of 50 or more inches is loose, gray, stratified gravel and sand.

Included with this soil in mapping are a few areas of the slightly better drained Red Hook soils on few small, slightly higher rises. Also included are small areas where clayey deposits are at a depth of less than 40 inches. Included drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

This Halsey soil has a high water table at or near the surface from September through June. It mostly limits rooting to the upper 10 to 12 inches of soil. Some areas are susceptible to ponding in the spring. Permeability is moderate or moderately slow in the subsoil and rapid or moderately rapid in the substratum. The available water capacity is moderate to high but is somewhat dependent on rooting depth. Runoff is slow to ponded. The surface layer has a high organic matter content. In unlimed areas, reaction ranges from medium acid through neutral in the surface layer and subsoil.

This soil is poorly suited to farming because there are few available outlets for drainage. With adequate drainage, it is suitable for most crops grown in the county. This soil is poorly suited to most urban uses because of wetness. Most of the acreage is idle, or it is wooded or pastured.

Without artificial drainage, this Halsey soil is not suited to cultivated crops, but where drained, it is especially productive for certain vegetable crops and for cash crops. In most areas, outlets for drainage are difficult to locate because the soil is low on the landscape. Open ditches, surface drainage, land shaping, or some combination of these with tile drainage is needed for adequate drainage. If this soil is drained and cultivated, using cover crops, keeping tillage to a minimum, and returning crop residue to the soil help maintain high organic matter content and promote good tilth.

This soil has limited suitability for pasture. Pasture plants should be able to tolerate long periods of wetness and restricted rooting depth. Grazing when the soil is wet is the major concern of pasture management. If the pasture is grazed when the soil is wet, compaction occurs and growth is restricted, which can lead to the loss of the pasture seeding. Land shaping can improve many areas for more productive pasture.

The potential of this soil for wood crops is low. The prolonged high water table severely limits the use of equipment for planting seedlings and harvesting timber. It also causes high seedling mortality and restricts rooting depth, which can result in trees uprooting during windstorms.

The prolonged high water table that is at or near the surface most of the year is a very serious limitation for most urban uses of this soil. Seepage and high risk of frost damage are also limitations for some uses. Many areas are well suited to wetland wildlife habitat. Some areas are excellent sites for dugout ponds.

This Halsey soil is in capability subclass IVw.

Hm—Hamlin silt loam. This deep and nearly level soil is well drained. It formed in silty alluvial deposits on the higher parts of flood plains along major streams in the county. The areas are generally oblong, and they parallel adjacent streams and creeks. Slope ranges from 0 to 3 percent. Areas of this soil range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of 42 inches. It is dark grayish brown silt loam in the upper part and brown silt loam in the lower part. The substratum to a depth of 65 inches or more is dark grayish brown silt loam.

Included with this soil in mapping are small areas of the Teel, Tioga, and Wayland soils. The Teel soils are similar to this Hamlin soil but are moderately well drained to somewhat poorly drained. The Tioga soils contain more sand and gravel than this Hamlin soil. The poorly drained and very poorly drained Wayland soils are in old meander scars and in low depressional areas. In a few included areas, bedrock is less than 40 inches below the surface. Areas of included soils range from 1/4 acre to 3 acres.

This Hamlin soil is subject to flooding from nearby streams for brief periods in some years. A seasonal high water table is at a depth of 3 to 6 feet from November through May and is somewhat controlled by the water level in the adjacent stream. Permeability is moderate. The available water capacity is high, and runoff is slow. There is usually no gravel in the surface layer, and bedrock is at a depth of 5 feet or more. In unlimed areas, the surface layer and subsoil range from strongly acid to neutral.

The soil is well suited to farming, but it is poorly suited to urban uses because of the flood hazard. Most of the acreage is farmed. Some areas are idle, and some are in woodland.

This Hamlin soil is well suited to cultivated crops. Flooding generally occurs early in the spring before crops are planted. Vegetable crops do very well on this gravel-free soil. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling at the proper soil moisture level, and rotating crops improve tilth and help maintain organic matter content. Timely planting of crops is essential to insure optimum yields. This soil is easy to till and is well suited to most crops grown in the region.

Pasture and hay crops also do well on this soil; however, overgrazing of pasture can cause loss of the seeding and restrict plant growth. Proper stocking, rotation of pasture, yearly mowing, and the deferment of grazing early in the spring are the chief management needs.

The potential of this soil for wood crops is very good, but only a small acreage is actually wooded. Erosion hazard, equipment limitation, seedling mortality, and windthrow hazard are generally not problems on this soil. However, planting seedlings early in the spring when the soil is moist insures their survival.

The flood hazard and high risk of frost damage are very serious limitations for many urban uses of this soil. This soil is an excellent source of topsoil. Some areas that are not seriously affected by flooding are well suited to recreational uses.

This Hamlin soil is in capability class I.

Hn—Haplaquolls, ponded. These are freshwater marshes made up of very poorly drained soils ponded with shallow water most of the year. They often border lakes, ponds, and other open bodies of water. These level soils formed in lacustrine, outwash, glacial till, and alluvial and organic deposits. Slope ranges from 0 to less than 1 percent. The soils in this map unit are classified above the series level because of the variability of their characteristics and properties.

Most areas are natural depressions, while others have been manmade or are areas that were dammed by beaver. Cattails, rushes, grasses, and other water-tolerant herbaceous plants are the dominant vegetation. In most areas there are commonly no trees, but where the water is very shallow, wetness-tolerant species are common.

The Haplaquolls are variable and covered with ponded water 5 to 10 inches deep. In one of the more common profiles the surface layer is mottled, black or gray loamy, silty, or sandy material enriched with organic material 5 to 25 inches thick. The underlying layers are mottled, gray or brown sandy, silty, or loamy deposits with varying amounts of gravel to a depth of 60 inches or more.

Onsite investigation is needed to determine the feasibility of a particular use of an area. Most uses involve drainage. These marshes are generally extremely difficult to drain because the water level is controlled by adjacent open bodies of water, and Haplaquolls are so low on the landscape that adequate outlets are not available. Most areas provide excellent habitat for wetland wildlife, including habitat for beaver, muskrat, fish, and waterfowl. In some areas wildlife habitat can be improved by constructing islands, building nesting boxes, and planting food-producing wetland shrubs.

These Haplaquolls are in capability subclass VIIIw.

HoA—Honeoye loam, 0 to 3 percent slopes. This nearly level soil is deep and well drained. It is on convex hilltops and ridgetops on glacial till plains. Some areas of this soil are quite broad, and most areas are irregular in shape. They range from 3 to 75 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown loam about 10 inches thick. The subsurface layer is light brownish gray loam about 2 inches thick. The subsoil is about 13 inches thick. It is brown loam in the upper part and reddish brown loam in the lower part. The substratum is brown gravelly loam to a depth of 60 inches.

Included with this soil in mapping are small intermingled areas of the Lima, Appleton, Cazenovia, and Ovid soils. The Lima soils are similar to this Honeoye soil but are moderately well drained. The somewhat poorly drained Appleton soils are on foot slopes and along drainageways. The Cazenovia and Ovid soils have a red color and a higher clay content in the subsoil than this Honeoye soil. The somewhat poorly drained Ovid soils are along a few drainageways. Some areas include the gently sloping Honeoye soils. Areas of included soils range up to 3 acres.

In the spring this Honeoye soil has a perched water table at a depth of 4 to 6 feet. Permeability is moderate in the subsoil but is slow or very slow in the underlying substratum. The available water capacity is moderate to high, and runoff is slow to medium. Gravel makes up 5 to 15 percent of the surface layer. Depth to bedrock is generally 5 feet or more. In unlimed areas, reaction is medium acid or slightly acid in the surface layer and medium acid through mildly alkaline in the subsoil.

This soil is well suited to farming and is suited to some urban uses. Most of the acreage is in cultivated crops or in hay. A few areas are in woodland, or they are idle.

This Honeoye soil is well suited to cultivated crops. Occasional surface stones or gravel cause slight problems in cultivating some crops. Drainage of included wet spots improves the use of some fields. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth and increase the organic matter content of the soil. This soil responds well to irrigation and is one of the better upland soils in the survey area for crop production. It is easier to irrigate than the gently sloping Honeoye soil.

This soil is well suited to pasture and hay crops. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods very early in the spring are the chief management needs.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Machine planting of tree seedlings is practical in large areas. The hazards of erosion, limited use of equipment, and seedling mortality are generally not problems on this soil.

The slow or very slow permeability in the substratum and the moderate risk of frost damage are limitations for urban uses of this Honeoye soil. The seasonal high water table, which is in the substratum at a depth of 4 to 6 feet, is a limitation for buildings that have deep basements. Because this substratum is firm, however, it provides sufficient support for the foundations of most buildings. Grading around homesites on this nearly level soil is important for proper runoff and surface drainage. This soil is suited to many recreational uses, particularly to athletic fields that require a nearly level site.

This Honeoye soil is in capability class I.

HoB—Honeoye loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on convex knolls and ridges on glacial till plains. Some areas are undulating. Areas of this soil are irregular in shape and range from 3 to 100 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown loam about 10 inches thick. The subsurface layer is light brownish gray loam about 2 inches thick. The subsoil is about 13 inches thick. It is brown loam in the upper part and reddish brown loam in the lower part. The substratum to a depth of 60 inches is brown gravelly loam.

Included with this soil in mapping are small intermingled areas of the Lima, Appleton, Cazenovia, and Ovid soils. The Lima soils are similar to this Honeoye soil but are moderately well drained. The somewhat poorly drained Appleton soils are on foot slopes and along some drainageways. The Cazenovia and Ovid soils have a red color and a higher clay content in the subsoil than this Honeoye soil. The somewhat poorly drained Ovid soils are along drainageways. Areas of included soils range up to 3 acres.

In the spring this Honeoye soil has a perched water table at a depth of 4 to 6 feet. Permeability is moderate in the subsoil but is slow or very slow in the underlying substratum. The available water capacity is moderate to high, and runoff is medium. Gravel makes up 5 to 15 percent of the surface layer. Depth to bedrock is generally 5 feet or more. In unlimed areas, reaction is medium acid or slightly acid in the surface layer and medium acid through mildly alkaline in the subsoil.

This soil is well suited to farming and is suited to some urban uses. Most of the acreage is in cultivated crops or in hay. A few areas are in woodland, or they are idle.

This Honeoye soil is well suited to cultivated crops. Occasional surface stones or gravel cause slight problems in cultivating some crops. Drainage of included wet spots improves the use of some fields. Erosion is a hazard in intensively cultivated areas and on long slopes. Keeping tillage to a minimum, using cover crops, tilling across slope, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth, increase organic matter content, and reduce the erosion hazard. This soil responds well to irrigation and is one of the better upland soils in the survey area for crop production.

It is also well suited to pasture and hay crops. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Machine planting of tree seedlings is practical in large areas. The hazards of erosion, limited use of equipment, and seedling mortality are generally not problems on this soil.

The slow or very slow permeability in the substratum and the moderate risk of frost damage are limitations for urban uses of this Honeoye soil. The seasonal high water table, which is in the substratum at a depth of 4 to 6 feet, is a limitation for buildings that have deep basements. Because the substratum is firm, however, it provides sufficient support for the foundations of most buildings. This soil is well suited to many recreational uses, such as campsites and picnic areas.

This Honeoye soil is in capability subclass IIe.

HrA—Hornell silt loam, 0 to 3 percent slopes. This nearly level soil is moderately deep and somewhat poorly drained. It formed in acid glacial till deposits that have a high clay content. This soil is in broad, nearly flat areas where the topography is influenced by the underlying bedrock. Soft shale bedrock is at a depth of 20 to 40 inches. Areas of this soil are oblong or irregular in shape and range from 3 to 60 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of 29 inches. It is mottled, yellowish brown silty clay loam in the upper part; mottled, light brownish gray silty clay loam in the middle part; and mottled, gray silty clay in the lower part. The substratum, to a depth of 40 inches, is olive gray shaly silty clay derived from decomposing shale bedrock. It is underlain by interbedded soft and hard shale bedrock.

Included with this soil in mapping are small intermingled areas of the Orpark, Derb, and Marilla soils. The Orpark soils are similar to this Hornell soil but coarser in texture. The Derb soils are underlain by soft shale bedrock at a depth of 40 to 60 inches. The Marilla soils formed in deep, shaly glacial till deposits and have a fragipan in the subsoil. Areas of included soils range up to 3 acres.

This Hornell soil has a perched seasonal high water table in the upper part of the subsoil from December through May. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate, and runoff is medium. Bedrock is within 20 to 40 inches of the surface. In unlimed areas, the surface layer is extremely acid to strongly acid and the subsoil is very strongly acid or strongly acid.

This soil has limited suitability for farming and most urban uses. Most of the acreage is idle or is in woodland. Some areas are used for pasture or are cultivated, and a few areas are in residential developments.

This Hornell soil is poorly suited to cultivated crops because of its seasonal wetness, clayey subsoil, and low natural fertility. Subsurface drainage can be difficult to install because soft shale bedrock is at a moderate depth. Plowing at the proper moisture content is important; the clayey subsoil tends to develop poor tilth and become cloddy if the soil is tilled when wet. Keeping tillage to a minimum, returning crop residues to the soil, including sod crops in the cropping system, and using cover crops help maintain good tilth, improve organic matter content, and increase crop yields. Liberal applications of fertilizer and lime are usually required for optimum crop growth.

Some areas are suited to hay and pasture if plant varieties that can withstand seasonal wetness are used. Overgrazing and grazing when the soil is wet are major concerns of pasture management. Overgrazing can cause the loss of the pasture seeding. Grazing when the soil is wet causes serious soil compaction, restricts plant growth, and can lead to the loss of the pasture plants. Liberal applications of lime and fertilizer are needed for maximum forage production.

The soil is mostly wooded, but the potential for wood crops is only fair. Seasonal wetness restricts the use of equipment on this soil and increases seedling mortality. Generally, there is little hazard of erosion or the uprooting of trees during windstorms.

The seasonal wetness, depth to bedrock, slow or very slow permeability, and clayey subsoil texture are serious limitations for most urban uses of this soil. Drains are often difficult to install around foundations because this nearly level soil lacks readily accessible outlets and bedrock is at a depth of 20 to 40 inches. During construction, the disturbed clay subsoil is difficult to recompact and tends to settle unevenly. This exposed subsoil is also erosive, unstable, and difficult to vegetate. Landscaping around buildings reduces the surface wetness.

This Hornell soil is in capability subclass IIIw.

HrB—Hornell silt loam, 3 to 8 percent slopes. This gently sloping soil is moderately deep and somewhat poorly drained. It formed in acid glacial till deposits that have a high clay content. This soil is in broad, smooth areas where the topography is influenced by the underlying bedrock. Soft shale bedrock is at a depth of 20 to 40 inches. Areas of this soil are oblong or irregular in shape and range from 3 to 75 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of 29 inches. It is mottled, yellowish brown silty clay loam in the upper part; mottled, light brownish gray silty clay loam in the middle part; and mottled, gray silty clay in the lower part. The substratum, to a depth of 40 inches, is olive gray shaly silty clay derived from decomposing shale bedrock. It is underlain by interbedded soft and hard shale bedrock.

Included with this soil in mapping are small intermingled areas of the Orpark, Derb, and Marilla soils. The Orpark soils are similar to this Hornell soil but have coarser textures. The Derb soils are underlain by soft shale bedrock at a depth of 40 to 60 inches. The Marilla soils formed in deep, shaly glacial till deposits and have a fragipan in the subsoil. Areas of included soils range up to 3 acres.

This Hornell soil has a perched seasonal high water table in the upper part of the subsoil from December through May. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate, and runoff is medium to rapid. Bedrock is within 20 to 40 inches of the surface. In unlimed areas, the surface layer is extremely acid to strongly acid, and the subsoil is very strongly acid or strongly acid.

This soil has limited suitability for farming and most urban uses. Most of the acreage is idle or is in woodland. Some areas are used for pasture or are cultivated, and a few areas are in residential developments.

This Hornell soil is poorly suited to cultivated crops because of seasonal wetness, clayey subsoil texture, erosion hazard, and low natural fertility. Subsurface drainage can be difficult to install because soft shale bedrock is at a moderate depth. Plowing at the proper moisture content is important; the clayey subsoil tends to develop poor tilth and become cloddy if the soil is tilled when wet. Erosion is a moderate hazard in cultivated areas. Keeping tillage to a minimum, returning crop residues to the soil, including sod crops in the cropping system, tilling on the contour, and using cover crops help maintain good tilth, reduce the erosion hazard, improve organic matter content, and increase crop yields. Liberal applications of fertilizer and lime are usually required for optimum crop growth.

Some areas are suited to hay and pasture if plant varieties that can withstand seasonal wetness are used. Overgrazing and grazing when the soil is wet are major concerns of pasture management. Overgrazing can cause the loss of the pasture seeding, and grazing when the soil is wet causes serious soil compaction and restricts plant growth, which can lead to the loss of the pasture plants. Liberal applications of lime and fertilizer are needed for maximum forage production.

The soil is mostly wooded, but potential for wood crops is only fair. Seasonal wetness restricts the use of equipment on this soil and increases seedling mortality. Generally, there is little hazard of erosion or the uprooting of trees during windstorms. Placing logging trails across the slope reduces the hazard of trail gullying or erosion.

The seasonal wetness, depth to bedrock, slow or very slow permeability, and clayey subsoil are serious limitations for most urban uses of this soil. Drains are often difficult to install around foundations because bedrock is at a depth of 20 to 40 inches. Interceptor drains or ditches placed upslope from buildings divert runoff and seepage. During construction, the disturbed clayey subsoil is difficult to recompact and tends to settle unevenly. This exposed subsoil is also very erosive, unstable, and difficult to vegetate.

This Hornell soil is in capability subclass IIIw.

HsC—Hornell silty clay loam, 8 to 15 percent slopes. This sloping soil is moderately deep and somewhat poorly drained. It formed in acid glacial till deposits that have a high clay content. This soil is on valley sides and hillsides where the topography is influenced by the underlying bedrock. Soft shale bedrock is at a depth of 20 to 40 inches. Areas of this soil are mostly oblong and range from 3 to 50 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 29 inches. It is mottled, yellowish brown silty clay loam in the upper part; mottled, light brownish gray silty clay loam in the middle part; and mottled, gray silty clay in the lower part. The substratum, to a depth of 40 inches, is olive gray shaly silty clay derived from decomposing shale bedrock. It is underlain by interbedded soft and hard shale bedrock.

Included with this soil in mapping are small intermingled areas of the Orpark, Derb, Marilla, and Schuyler soils. The Orpark soils are similar to this Hornell soil but coarser in texture. The Derb soils are underlain by soft shale bedrock at a depth of 40 to 60 inches. The Marilla soils formed in deep, shaly glacial till deposits and have a fragipan in the subsoil. The moderately well drained, moderately steep Schuyler soils are higher on the landscape and are underlain by bedrock at a depth of 40 inches or more. Included are a few areas of a soil that is severely eroded. Areas of included soils range up to 3 acres.

This Hornell soil has a perched seasonal high water table in the upper part of the subsoil from December through May. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate, and runoff is rapid. Depth to bedrock is within 20 to 40 inches of the surface. In unlimed areas, the surface layer is extremely acid to strongly acid, and the subsoil is very strongly acid or strongly acid.

This soil has limited suitability for farming and urban uses. Most of the acreage is idle or is in woodland. Some areas are used for pasture or are cultivated, and a few areas are in residential developments.

This Hornell soil is only moderately suited to cultivated crops because of seasonal wetness, high clay content in the surface layer, serious erosion hazard, and low natural fertility. Subsurface drainage can be difficult to install because shale bedrock is at a moderate depth. Plowing at the proper moisture content is important because the surface layer and subsoil tend to develop poor tilth and become cloddy if the soil is tilled when wet. Erosion is a serious hazard in cultivated areas and on long slopes. Keeping tillage to a minimum, returning crop residues to the soil, stripcropping, including sod crops in the cropping system, tilling on the contour, and using cover crops help maintain good tilth, reduce the erosion hazard, improve organic matter content, and increase crop yields. Because this soil is naturally low in fertility, liberal applications of fertilizer and lime are usually needed for optimum crop growth.

Many areas are better suited to hay or pasture than to cultivated crops if plant varieties that can withstand seasonal wetness are used. Overgrazing and grazing when the soil is wet are major concerns of pasture management. Overgrazing can cause the loss of the pasture seeding, and grazing when the soil is wet causes serious soil compaction and restricts plant growth, which can lead to the loss of the pasture plants. Liberal applications of lime and fertilizer are needed for maximum forage production.

The soil is mostly wooded, but the potential for wood crops is only fair. Seasonal wetness restricts the use of equipment on the soil and increases seedling mortality. Generally, there is little hazard of the uprooting of trees during windstorms. Placing logging trails across the slope reduces the hazard of trail gullying or erosion.

Seasonal wetness, depth to bedrock, slope, slow or very slow permeability, and the clayey subsoil texture are serious limitations for most urban uses of this soil. Drains are often difficult to install around foundations because bedrock is at a depth of at 20 to 40 inches. Interceptor drains or ditches placed upslope from buildings help divert runoff and seepage from higher adjacent soils. During construction, the disturbed clayey subsoil is difficult to recompact and tends to settle unevenly. This exposed subsoil is also very erosive, unstable, and difficult to vegetate, but reestablishing vegetation as soon as possible reduces the erosion hazard.

This Hornell soil is in capability subclass IIIe.

HuB—Hudson silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in glacial lake sediment that have a high content of clay and silt. This soil is in undulating areas and on ridges and knolls on the lowland lake plain. Areas of this soil are elongated along major streams and irregular in shape in other areas. Most areas range from 3 to 30 acres on the lake plains and range up to 100 acres along streams.

Typically, this soil has a surface layer of brown silt loam about 8 inches thick. The subsurface layer is pale brown silt loam about 6 inches thick. The subsoil extends to a depth of 29 inches. It is dark grayish brown silty clay and has thin interfingers of pale brown material in the upper part. The substratum is dark grayish brown clay with thin lenses of silt to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Collamer, Cayuga, and Rhinebeck soils. The Collamer soils are more silty and have a lower clay content than this Hudson soil. The Cayuga soils formed in loamy deposits that are 40 inches deep. The somewhat poorly drained Rhinebeck soils are in nearly flat areas and along some drainageways. Areas of included soils range from 1/4 acre to 3 acres.

This Hudson soil has a perched seasonal high water table in the lower part of the subsoil from November through April. Permeability is moderate or moderately slow in the surface and subsurface layers and slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is medium. Depth to bedrock is generally 5 feet or more, and there are usually no small rocks in the soil. In unlimed areas, the surface layer is strongly acid to neutral and the subsoil is slightly acid to neutral.

This soil is suited to farming but has limited suitability for most urban uses. Most of the acreage is cultivated or is in hay, pasture, or woodland. Some areas have been urbanized, and some areas are idle.

This Hudson soil is suited to cultivated crops, but erosion is a problem where the soil is left unprotected. Temporary seasonal wetness in the spring can delay some tillage and planting operations. Plowing at the proper soil moisture content is important because the soil tends to form hard clods and the surface becomes crusty if it is cultivated when wet. Keeping tillage to a minimum, using cover crops, returning crop residues to the soil, plowing at the proper soil moisture content, and including sod crops in the cropping system improve tilth and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. These practices and cross-slope tillage also help control erosion. Subsurface drainage of included wet spots makes earlier cultivation of many fields possible.

This soil is well suited to pasture and hay. Grazing when the soil is wet causes soil compaction and trampling of pasture plants, which lead to restricted plant growth and to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and the deferment of grazing during wet periods are the main requirements for good pasture management.

Timber production on this soil is good. Seedlings should be planted early in the spring when the soil is moist. Erosion is usually not a hazard, unless the timber is clearcut and the ground cover is removed. There are few restrictions to the use of equipment on this soil, and uprooting of trees during windstorms is usually not a problem.

The temporary seasonal wetness, slow or very slow permeability in the subsoil, high risk of frost damage, and the clayey subsoil and substratum are serious limitations for many urban uses of this soil. Drains placed upslope from building foundations reduce the problem of wetness by diverting runoff and seepage. When the soil is disturbed during construction, it is difficult to recompact and soil settlement is often uneven. This soil is also subject to serious erosion when vegetation is removed from construction sites and needs to be revegetated as soon as possible. Some areas are suited to recreational uses, such as campsites and picnic areas.

This Hudson soil is in capability subclass IIe.

HuC—Hudson silt loam, 8 to 15 percent slopes. This sloping soil is deep and moderately well drained. It formed in glacial lake sediment that have a high content of clay and silt. This soil is in rolling areas and on sides of ridges, knolls, dissected areas, and valleys. Areas of this soil are elongated along dissecting streams and valleys and irregular in shape in other areas. Areas of this soil range from 3 to 50 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of brown silt loam about 8 inches thick. The subsurface layer is pale brown silt loam about 6 inches thick. The subsoil extends to a depth of 29 inches. It is dark grayish brown silty clay and has thin interfingers of pale brown material in the upper part. The substratum is dark grayish brown varved clay with thin lenses of fine silt to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Collamer, Cayuga, and Rhinebeck soils. The Collamer soils are more silty and lower in clay content than this Hudson soil. The Cayuga soils formed in loamy deposits that are 40 inches deep, and the somewhat poorly drained Rhinebeck soils are on foot slopes and along some drainageways. Included are a few areas of the Schoharie soils, which formed in reddish sediment. Areas of included soils range from 1/4 acre to 3 acres.

This Hudson soil has a perched seasonal high water table in the lower part of the subsoil from November through April. Permeability is moderate or moderately slow in the surface and subsurface layers and slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is rapid. Depth to bedrock is generally 5 feet or more, and there are usually no small rocks in the soil. In unlimed areas, the surface layer is strongly acid to neutral and the subsoil is slightly acid to neutral.

This soil has limited suitability for farming and is poorly suited to most urban uses. Most of the acreage is idle or is in hay, pasture, or woodland. Some areas are cultivated, and a few areas are urbanized.

This Hudson soil can be used for cultivated crops, but erosion is a serious hazard, particularly on long slopes. Temporary seasonal wetness in the spring can delay tillage and planting operations. Plowing at the proper soil moisture content is important because the soil tends to form hard clods and the surface becomes crusty if cultivated when wet. Keeping tillage to a minimum, using cover crops, tilling across slope, returning crop residues to the soil, stripcropping, plowing at the proper soil moisture content, and frequently including sod crops in the cropping system improve tilth, control erosion, and increase organic matter content. Increasing the organic matter content improves the available water capacity of the soil. Subsurface drainage of included wet spots makes earlier cultivation of many fields possible.

This soil is well suited to pasture and hay. Grazing when the soil is wet early in the spring causes soil compaction and trampling of pasture plants, which reduce plant growth and increase the hazard of erosion. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the main requirements for good pasture management.

Timber production on this soil is good. Seedlings should be planted early in the spring when the soil is moist. On this Hudson soil, erosion is a hazard if the timber is clearcut and the ground vegetation is removed. Placing logging trails across the slope reduces the hazard of trail gullying. There are few restrictions in the use of equipment, and uprooting of trees during windstorms is usually not a problem.

Temporary seasonal wetness, slope, slow or very slow permeability in the subsoil, high risk of frost damage, and the clayey texture in the subsoil and substratum are serious limitations for most urban uses of this soil. Drains placed upslope from building foundations reduce the problem of wetness by diverting runoff and seepage. When the soil is disturbed during construction, it is difficult to recompact and often settles unevenly. This soil is also subject to serious erosion when vegetation is removed from construction sites and needs to be revegetated as soon as possible. Excavations in toe slope areas can cause the soil to slump and slide.

This Hudson soil is in capability subclass IIIe.

HvD—Hudson silty clay loam, 15 to 25 percent slopes. This moderately steep soil is deep and moderately well drained. It formed in glacial lake sediment that has a high content of clay and silt. This soil is on sides of dissected areas, ridges, and valleys. In some places, the surface has a stepped or hummocky appearance because the soil tends to slump and slide. Areas of this soil are elongated on side slopes that are adjacent to creeks and streams. They range from 3 to 75 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of brown silty clay loam about 6 inches thick. The subsurface layer is pale brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 29 inches. It is dark grayish brown silty clay and has thin interfingers of pale brown material in the upper part. The substratum is dark grayish brown clay with thin lenses of silt to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Collamer, Cayuga, and Rhinebeck soils. The Collamer soils are more silty and lower in clay content than this Hudson soil. The Cayuga soils formed in loamy deposits that are 40 inches deep. The somewhat poorly drained Rhinebeck soils are on foot slopes and along some drainageways. Also included are a few small areas of the Varysburg soils that formed in clayey sediment mantled with gravelly deposits, and some areas of the sloping Hudson soils. Areas of the included soils range from 1/4 acre to 3 acres.

This Hudson soil has a perched seasonal high water table in the lower part of the subsoil from November through April. Permeability is moderate or moderately slow in the surface and subsurface layers and slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is rapid. Depth to bedrock is generally 5 feet or more, and there are usually no small rocks in the soil. In unlimed areas, the surface layer is strongly acid to neutral and the subsoil is slightly acid to neutral.

This soil has serious limitations for farm and urban uses. Most of the acreage is in woodland, or it is idle. Some areas are pastured.

This Hudson soil is poorly suited to cultivated crops because of the moderately steep slopes and the associated very serious erosion hazard. Use of farm equipment on this soil is somewhat difficult and hazardous, particularly where the topography is uneven as a result of soil slumps and slips. If cultivated crops are grown, it should be infrequently, and a maximum of conservation practices should be used to control erosion. Maintaining good tilth is difficult because of the high clay content of the surface layer.

Where this soil is used for pasture, overgrazing and grazing when the soil is wet are serious management problems. Overgrazing leads to the loss of the pasture grasses, which can result in serious erosion and gullying. Grazing when the soil is wet causes soil compaction and trampling of grasses, which can increase the hazard of erosion and can reduce forage growth.

Timber production on this soil is fair to good. Machine planting of seedlings and harvesting timber are difficult because of the moderately steep slopes. Placing logging trails across the slope reduces trail gullying and erosion. Clearcutting should also be avoided because of the erosion hazard.

The moderately steep slopes, soil stability, wetness and seepage, clayey texture, slow or very slow permeability, and high erosion potential are serious limitations for most urban uses of this soil. Excavations in toe-slope areas can cause massive soil slumps or slides. Building in toe-slope areas is hazardous for this reason, and roads built on this soil are subject to serious frost heave. Most areas are suited to natural plant cover, and in some areas the potential for improving wildlife habitat is excellent.

This Hudson soil is in capability subclass IVe.

HvE—Hudson silty clay loam, 25 to 40 percent slopes. This steep soil is deep and moderately well drained. It formed in glacial lake sediment that has a high content of clay and silt. This soil is on the sides of dissected areas, ridges, and valleys. In many places, the surface has a stepped appearance because the soil tends to slump and slide. Areas of this soil are elongated on side slopes adjacent to creeks and streams and range from 3 to 100 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of brown silty clay loam about 6 inches thick. The subsurface layer is pale brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 29 inches. It is dark grayish brown silty clay and has thin interfingers of pale brown material in the upper part. The substratum is dark grayish brown clay with thin lenses of silt to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Collamer, Cayuga, and Rhinebeck soils. The Collamer soils are more silty and lower in clay content than this Hudson soil. The Cayuga soils formed in material that is loamy within 40 inches of the surface. The somewhat poorly drained Rhinebeck soils are on foot slopes and along some drainageways. Also included are a few small areas of the Varysburg soils that formed in clayey sediment mantled with gravelly deposits, and a few areas of a severely eroded soil. Areas of the included soils range from 1/4 acre to 3 acres.

This Hudson soil has a perched seasonal high water table in the lower part of the subsoil from November through April. Permeability is moderate or moderately slow in the surface and subsurface layers and slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is very rapid. Depth to bedrock is generally 5 feet or more, and there are often no small rocks in the soil. In unlimed areas, the surface layer is strongly acid to neutral and the subsoil is slightly acid to neutral.

This soil is poorly suited for farming and urban uses. Most of the acreage is in woodland, or it is idle.

This Hudson soil is not suited to cultivated crops or hay because of the steep slopes and the associated very serious erosion hazard. Use of farm equipment is very difficult and extremely hazardous, particularly where the topography is uneven as a result of soil slumps and slips. Some areas have limited use for pasture, but reseeding or applying fertilizer is usually not feasible.

Where this soil is used for pasture, overgrazing and grazing when the soil is wet are serious management problems. Overgrazing can lead to the loss of the pasture grasses, which can cause serious erosion and gullying. Grazing when the soil is wet can result in soil compaction and trampling of grasses, which increases the hazard of erosion.

Timber production on this soil is fair to good. Machine planting of seedlings and harvesting timber are extremely difficult because of the steep slopes. Placing logging trails across the slope reduces trail gullying and erosion. Clearcutting should also be avoided because of the erosion hazard.

The steep slopes, soil stability, temporary seasonal wetness and seepage, clayey texture, slow or very slow permeability, and severe erosion hazard are serious limitations for urban uses of this soil. Excavations in toe-slope areas can cause massive soil slumps or slides. Building adjacent to this soil is hazardous for this reason. Most areas are best suited to natural plant cover. In some areas, the woodland wildlife habitat can be improved.

This Hudson soil is in capability subclass VIe.

HwD—Hudson gravelly loam, hilly. This hilly soil is deep and moderately well drained. It formed in silty and clayey glacial lake sediment that has a thin mantle of gravelly deposits. This soil is on low hills, ridges, and along lower valley sides. Areas of this soil are elongated and irregular in shape. The areas range from 3 to 80 acres.

Typically, this soil has a surface layer of brown gravelly loam about 8 inches thick. The subsoil extends to a depth of 29 inches. It is dark grayish brown silty clay and has thin interfingers of pale brown material in the upper part. The substratum is dark grayish brown clay with thin lenses of silt to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Varysburg, Cayuga, and Rhinebeck soils. The Varysburg soils have a gravelly surface mantle about 20 to 40 inches thick. The Cayuga soils formed in material that is loamy within 40 inches of the surface. The somewhat poorly drained Rhinebeck soils are on foot slopes and along some drainageways, and they commonly have seep spots. Also included are some areas of the sloping Hudson soils and a few areas of a soil that is severely eroded. Areas of the included soils range from 1/4 acre to 3 acres.

This Hudson soil has a perched seasonal high water table in the lower part of the subsoil from November through April. Permeability is moderate or moderately slow in the surface layer and slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is rapid. Depth to bedrock is generally 5 feet or more, and gravel makes up 15 to 25 percent of the surface layer. In unlimed areas, the surface layer is strongly acid to neutral and the subsoil is slightly acid to neutral.

This soil has serious limitations for farming and urban uses. Most of the acreage is in woodland, or it is idle. Some areas are pastured.

This Hudson soil is poorly suited to cultivated crops because of the irregular, hilly topography and the associated serious erosion hazard and the many seep spots. Use of farm equipment on this soil is somewhat difficult and hazardous. Gravel in the surface layer also limits equipment use and causes rapid wear of machinery. If cultivated crops are grown, it should be infrequently and a maximum of conservation practices should be used to control erosion. Maintaining good tilth is difficult because of the high clay content of the soil. This soil is difficult to manage because of the complex slopes.

Many areas can be used for pasture, and some areas are suitable for hay crops. Where this soil is used for pasture, overgrazing and grazing when the soil is wet are serious management problems. Overgrazing leads to the loss of the pasture grasses, which can cause serious erosion and gullying. Grazing when the soil is wet results in soil compaction and trampling of grasses, which increases the hazard of erosion and reduces forage growth.

Timber production on this soil is fair to good. Machine planting of seedlings and harvesting timber are somewhat difficult because of the moderately steep slopes. Placing logging trails across the slope reduces trail gullying and erosion.

The slope, soil stability, temporary seasonal wetness, included seep spots, clayey texture, and slow or very slow permeability in the subsoil are serious limitations for most urban uses of the soil. Erosion becomes a more serious hazard if the gravelly surface layer is removed. Excavations in toe-slope areas can cause massive soil slumps or slides that make building hazardous. Roads built on this soil are often subject to serious frost heave. Most areas are suited to natural plant cover, and in some areas the potential for improving wildlife habitat is excellent.

This Hudson soil is in capability subclass IVe.

In—Ilion silt loam. This nearly level soil is deep and poorly drained. It formed in calcareous glacial till deposits. This soil is on depressions and along drainageways on glacial till plains. Areas of this soil are roughly circular to oblong and range from 3 to 50 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of very dark gray silt loam about 9 inches thick. The subsurface layer is mottled, light brownish gray silt loam 4 inches thick. The subsoil extends to a depth of 29 inches. It is mottled, dark grayish brown and very dark grayish brown silty clay loam. The substratum to a depth of 60 inches or more is mottled, very dark grayish brown shaly silty clay loam.

Included with this soil in mapping are small intermingled areas of the Darien, Lyons, and Appleton soils. The Darien soils are somewhat poorly drained and are on slightly raised benches. The Lyons soils and the somewhat poorly drained Appleton soils have less clay in the subsoil than this Ilion soil. Also included are some areas of a soil that have a mucky surface layer. Areas of included soils range up to 3 acres.

This Ilion soil has a perched water table at or near the surface from November through May. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. Bedrock is at a depth of 5 feet or more. Shale fragments make up 0 to 15 percent of the surface layer. In unlimed areas, the surface layer and the upper part of the subsoil range from medium acid to neutral.

Prolonged wetness is a serious limitation for most farm and urban uses of this soil. Most areas are in pasture or woodland.

Because of prolonged wetness and the clayey subsoil, this Ilion soil is poorly suited to cultivated crops. Drainage is necessary if cultivated crops are grown, but finding suitable drainage outlets is often difficult because the soil is low on the landscape. The drains usually require close spacing to be effective because the subsoil is slowly or very slowly permeable. In drained areas, keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops improve tilth and help maintain organic matter content. Because of the clayey subsoil, plowing when the soil is wet destroys soil tilth and structure.

This soil is poorly suited to hay and pasture, unless it is at least partially drained. In areas that are used for pasture, the main concern is avoiding grazing when the soil is wet. It causes soil compaction and trampling of forage plants, which can result in lower quality pasture.

The potential of this soil for wood crops is fair. A substantial acreage is wooded. Prolonged wetness is a serious limitation for the use of farm equipment and causes high seedling mortality. By restricting rooting depth, wetness also can result in the uprooting of trees during windstorms.

The prolonged wetness, slow or very slow permeability, and high risk of frost damage are serious limitations for most urban uses of this soil. Some areas are good sites for ponds. Many areas are excellent for the development of wetland wildlife marshes.

This Ilion soil is in capability subclass IVw.

Ke—Kendaia silt loam. This nearly level soil is deep and somewhat poorly drained. It formed in calcareous glacial till deposits. This soil is on moderately low, broad flats, on toe slopes, and along drainageways on till plains. Slope is 0 to 3 percent. Most areas of this soil range from 10 to 50 acres, but some areas are more than 100 acres.

Typically, the surface layer is very friable, very dark grayish brown silt loam 8 inches thick. The subsoil is 24 inches thick. The upper part is mottled, brown heavy silt loam, and the lower part is mottled, dark reddish brown heavy silt loam. The substratum to a depth of 60 inches or more is very firm, dark reddish brown gravelly silt loam.

Included with this soil in mapping are small areas of the Ovid soils that have a slightly higher clay content than this Kendaia soil. Included also in small depressions and along drainageways are spots of the poorly drained and very poorly drained Lyons soils. Included wet spots and drainageways are indicated by special symbols on the soil map. Areas of included soils are 1/4 acre to 3 acres.

This Kendaia soil has a perched seasonal high water table in the upper part of the subsoil from November through May, which limits root penetration. Gravel makes up from 5 to 15 percent of the surface layer. Permeability is moderate in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is slow. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from slightly acid to mildly alkaline in the subsoil.

This soil is moderately suited to farming and poorly suited to most urban uses. Most of the acreage is cultivated or is used for pasture. Some areas of this soil are in woodland.

Without drainage, this soil is only moderately suited to cultivated crops. With adequate drainage, it is suitable for most crops grown in the county, except early-market and long-season varieties. Because of the slowly permeable substratum, subsurface drains usually require close spacing to be effective. Drains or ditches that intercept seepage and runoff from higher adjacent soils are needed in many areas. Occasional surface stones are bothersome in planting some crops and cause more rapid wear of machinery. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and including sod crops in the cropping system help maintain good tilth, increase organic matter content, and improve crop yields.

This soil is well suited to pasture. If the pasture is grazed when wet, soil compaction and trampling of forage plants occur and plant growth is reduced. Proper stocking, rotation of pastures, yearly mowing, deferment of grazing, and restricted grazing when the soil is wet are the main management needs.

Timber production on this soil is fair to good. Seasonal wetness is a moderate limitation for the use of planting and harvesting equipment and also limits root development. The soil is generally stable enough for trees, except during periods of excessive wind velocity. Seedlings that can withstand a seasonal high water table are best suited to this soil.

The seasonal high water table and slow permeability in the substratum are serious limitations for many urban uses of this soil. Drains around foundations reduce the problems associated with the seasonal high water table. Proper grading around buildings helps eliminate surface wetness. Some areas are good sites for ponds.

This Kendaia soil is in capability subclass IIIw.

La—Lakemont silt loam. This level or nearly level soil is deep and poorly drained. It is in narrow swales and in broad, slightly concave areas in the northern part of the county. These areas were once the bottoms of glacial lakes. This clayey soil frequently is adjacent to the drier and slightly higher Odessa soils. Slope ranges from 0 to 3 percent. Areas of this soil are oblong or irregular in shape or are elongated along drains, and they range from 3 to 50 acres or more.

Typically, this soil has a surface layer of very dark brown silt loam about 9 inches thick. The subsurface layer is mottled, gray silty clay loam about 4 inches thick. The subsoil is about 16 inches thick. It is mottled, brown silty clay in the upper part and mottled, dark reddish gray silty clay in the lower part. The substratum is mottled, reddish brown silty clay loam to a depth of 60 inches.

Included with this soil in mapping are small areas of the Odessa, Canandaigua, and Cheektowaga soils. The Odessa soils are drier than this Lakemont soil and are on convex rises. This Lakemont soil formed in clayey sediments, but the Canandaigua soils formed in silty sediment, and the Cheektowaga soils formed in a thin mantle of fine sand underlain by clay. In some included areas, particularly near the center of depressions, the surface layer is mucky. Areas of included soils range from 1/2 acre to 3 acres.

From November through June this Lakemont soil has a high water table at or near the surface. Permeability is very slow. The available water capacity is moderate to high, and runoff is very slow. There is usually no gravel in the soil. Depth to bedrock is generally many feet deep. The surface layer and subsoil are slightly acid or neutral.

The suitability of this soil for farm and urban uses is very limited by the prolonged wetness, very slow permeability, tendency of the soil to shrink and swell, clayey texture, low soil strength, and poor stability when excavated. Most of the acreage is in woodland, or it is idle. Some areas are farmed, and a few areas are used for urban purposes.

This Lakemont soil is poorly suited to cultivated crops, unless adequately drained. Erosion is not a problem on this nearly level soil. Tillage can be somewhat difficult because the soil is clayey and tends to puddle and compact if tilled when wet. It is difficult to drain in many places because of restricted drainage outlets and the very slow permeability in the subsoil. If management includes adequate drainage, keeping tillage to a minimum, including grasses and legumes in the cropping system, and using cover crops, this Lakemont soil is suitable for most crops grown in the county, except early-market and long-season varieties.

Without adequate drainage, this soil can be used sparingly for pasture. Overgrazing and grazing when the soil is wet are concerns of pasture management. Overgrazing can cause the loss of the pasture seeding, and grazing when the soil is wet causes soil compaction, restricted plant growth, and the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs. If the soil is partially drained, pasture productivity can be greatly improved.

The potential of this soil for wood crops is poor. Erosion is usually not a problem, but the prolonged high water table seriously limits the use of farm equipment and causes excessive seedling mortality. Prolonged wetness also limits the penetration of tree roots, and thus trees are unable to withstand major windstorms.

The prolonged wetness, very slow permeability, low strength, and poor stability of this Lakemont soil are very serious limitations for urban uses. If the clayey subsoil is disturbed during construction, it is difficult to recompact and tends to settle under a load. Exposed subsoil is erodible, unstable, and difficult to vegetate. This soil is often best suited to the development of wetland wildlife habitat. It is naturally suitable for various wetland and shallow water plants and wetland fauna. In addition, this soil provides good sites for excavated ponds.

This Lakemont soil is in capability subclass IVw.

Lb—Lakemont mucky silt loam. This level or nearly level soil is deep and very poorly drained. It is in narrow swales and other depressions, mostly on the lake plain in the northern part of the county. Slope is 0 to 2 percent. Areas of this soil are circular or irregular in shape or are elongated along drainageways, ranging in size from 3 to 30 acres or more.

Typically, this soil has a surface layer of very dark brown mucky silt loam 9 inches thick. The subsurface layer is mottled, gray silty clay loam about 4 inches thick. The subsoil is 16 inches thick. It is mottled, brown silty clay in the upper part and mottled, dark reddish gray silty clay in the lower part. The substratum below a depth of 29 inches is mottled, reddish brown silty clay loam.

Included with this soil in mapping are small areas of the Palms, Canandaigua, and Canadice soils. This Lakemont soil formed in clayey sediments, but the Palms muck formed in organic deposits more than 16 inches thick, and the Canandaigua soils formed in silty sediments. The Canadice soils have more gray or olive color than this Lakemont soil. Some included soils, particularly near the outer edge of depressions, are poorly drained and do not have a mucky surface layer. Areas of included soils range from 1/2 acre to 2 acres.

From November through June this Lakemont soil has a high water table at or near the surface. Some areas are ponded in the spring. Permeability is very slow. The available water capacity is moderate to high, and runoff is very slow or ponded. There is usually no gravel in the soil, and bedrock is generally more than 5 feet deep. The surface layer and subsoil are slightly acid or neutral.

Because of prolonged wetness, temporary spring ponding, very slow permeability, tendency of the soil to shrink and swell, clayey texture, low soil strength, and poor stability when excavated, this soil has very limited suitability for farm and urban uses. Most of the acreage is in woodland, or it is idle. A few areas are used for pasture.

This Lakemont soil is poorly suited to cultivated crops, unless adequately drained. Drainage is very difficult to install because the soil is very low on the landscape and suitable outlets are often not available. If drainage is feasible, drains usually require close spacing to be effective because the subsoil is very slowly permeable. In drained areas, puddling and compaction are a danger if this clayey soil is tilled when wet. If management includes adequate drainage and keeping tillage to a minimum, including grasses and legumes in the cropping system, and using cover crops, this Lakemont soil is suitable for some crops grown in the county, particularly those that have a short growing season.

Partial drainage of this soil is usually needed to make it suitable for pasture. Grazing when the soil is wet causes compaction, restricted plant growth, and the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crop is poor. Erosion is usually not a problem, but the prolonged high water table and temporary ponding seriously limit the use of equipment and cause excessive seedling mortality. Prolonged wetness also limits the penetration of tree roots, and thus trees are unable to withstand major windstorms.

The prolonged wetness, temporary ponding, very slow permeability, low strength, and poor stability of this Lakemont soil are very serious limitations for urban uses. If the clayey subsoil is disturbed during construction, it is difficult to recompact and is subject to settling under a load. Exposed subsoil is erodible, unstable, and difficult to vegetate. This soil is suitable for various wetland and shallow water plants and for wetland fauna. Many areas provide excellent sites for the development of wetland wildlife marshes and good sites for excavated ponds.

This Lakemont soil is in capability subclass IVw.

Lc—Lamson very fine sandy loam. This nearly level soil is deep and poorly drained. It formed in glacial lake sediments that have a high sand content. This soil is in nearly flat areas of lowland glacial lake plains. Slope ranges from 0 to 3 percent. Areas of this soil are irregular in shape and range from 5 to 100 acres in size, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of very dark brown very fine sandy loam about 9 inches thick. The subsurface layer is mottled, light gray loamy very fine sand about 5 inches thick. The subsoil is 26 inches thick. The upper part is mottled, brown fine sandy loam, and the lower part is mottled, grayish brown fine sandy loam. The substratum to a depth of 50 inches or more is mottled, light brownish gray loamy very fine sand.

Included with this soil in mapping are small intermingled areas of the Minoa and Cheektowaga soils. The somewhat poorly drained Minoa soils are on slight rises, and the Cheektowaga soils formed in sandy material underlain by clay at a depth of 20 to 40 inches. In some depressional areas, the surface layer is mucky. Included in some areas is a soil that is similar to this Lamson soil but coarser textured and somewhat better drained. Areas of included soils range from 1/4 acre to 3 acres.

This Lamson soil has a high water table at or near the surface from December through May. Permeability is moderate or moderately rapid throughout the soil. The available water capacity is moderate to high, and runoff is very slow. Depth to bedrock is generally 5 feet or more, and there are usually no rocks in the soil. Reaction is medium acid to mildly alkaline in the surface layer and slightly acid to moderately alkaline in the subsoil.

Because of prolonged wetness, this soil has limited suitability for most farm and urban uses. Most areas are wooded or idle. Some areas are in pasture, and a few areas are drained and cultivated.

This Lamson soil is poorly suited to cultivated crops, unless drained. Drainage outlets are often difficult to install because the soil is low on the landscape. Where drainage is feasible, this soil is well suited to field crops and to some vegetable crops. If the soil is cultivated, keeping tillage to a minimum, using cover crops, returning crop residues to the soil, and plowing at the proper soil moisture content help maintain good tilth, increase organic matter content, and improve crop yields.

Pasture and hay crops do poorly on this soil, unless it is partially drained. Land leveling or a bedding system of land management improves drainage enough that some wetness-tolerant pasture grasses can be grown. Grazing should be restricted when the soil is wet to prevent compaction of the soil and trampling of pasture plants.

The potential of this soil for wood crops is fair to poor. Only those species that can tolerate prolonged wetness are suited to this soil. The prolonged high water table also limits the use of planting and harvesting equipment and restricts rooting depth. Because of the restricted rooting depth, trees are susceptible to uprooting during windstorms.

Because of prolonged wetness and high frost-damage potential, this soil is seriously limited for most urban uses. On excavated sites, the sidewalls are unstable and tend to slump or slide. Some areas are suited to the development for wetland wildlife habitat.

This Lamson soil is in capability subclass IIIw.

Ld—Lamson mucky very fine sandy loam. This nearly level soil is deep and very poorly drained. It formed in glacial lake sediments that have a high sand content. The surface layer has an accumulation of decomposed organic material. This soil is in deep depressions, mainly on the lowland lake plain. Slope ranges from 0 to 2 percent. Areas of this soil are irregular in shape and range from 5 to 50 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of black mucky very fine sandy loam about 9 inches thick. The subsurface layer is mottled, light gray loamy very fine sand about 5 inches thick. The subsoil is 26 inches thick. The upper part is mottled, brown fine sandy loam, and the lower part is mottled, grayish brown fine sandy loam. The substratum to a depth of 50 inches or more is mottled, light brownish gray loamy very fine sand.

Included with this soil in mapping are small intermingled areas of the Minoa and Cheektowaga soils.

The somewhat poorly drained Minoa soils are on slight rises, and the Cheektowaga soils formed in sandy material underlain by clay at a depth of 20 to 40 inches. In some areas, there is no accumulation of organic matter in the surface layer. Also included in some areas is a soil that is similar to this Lamson soil but coarser textured and somewhat better drained. Areas of included soils range from 1/4 acre to 3 acres.

This Lamson soil has a high water table at or near the surface from December through May. Ponding is common in the spring. Permeability is moderate or moderately rapid througout the soil. The available water capacity is moderate to high, and runoff is very slow or ponded. Depth to bedrock is generally 5 feet or more, and there are usually no rock fragments in the soil. Reaction is medium acid to mildly alkaline in the surface layer and slightly acid to moderately alkaline in the subsoil.

Because of prolonged wetness and ponding, this soil has limited suitability for farm uses and is not suited for most urban uses. Most areas are wooded or idle.

This Lamson soil is very poorly suited to cultivated crops and hay, unless adequately drained. Drainage outlets are extremely difficult to install because the soil is very low on the landscape. Where drainage is feasible, a combination of open ditches and subsurface drains is generally desirable. Properly drained, this soil is suited to field crops and some vegetable crops. If the soil is cultivated, keeping tillage to a minimum, using cover crops, returning crop residues to the soil, and plowing at the proper soil moisture content help promote good tilth, maintain the high organic matter content, and improve crop yields.

This soil is poorly suited to pasture, unless it is at least partially drained. Land leveling or a bedding system of land management improves drainage enough that some wetness-tolerant pasture grasses can be grown. Grazing should be restricted when the soil is wet to prevent compaction of the soil and trampling of pasture plants.

The potential of this soil for wood crops is poor. Only those species that can tolerate prolonged wetness are suited. The prolonged high water table and seasonal ponding limit the use of planting and harvesting equipment and restrict rooting depth. Because of the restricted rooting depth, trees are susceptible to uprooting during windstorms.

The prolonged wetness, ponding, and high risk of frost damage of this soil are serious limitations for urban uses. On excavated sites, the sidewalls are unstable and tend to slump or slide. Some areas are well suited to wetland wildlife habitat.

This Lamson soil is in capability subclass IVw.

LfB—Langford channery silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained and moderately well drained. It formed in glacial till deposits derived mainly from limestone and shale. This soil is in smooth, somewhat convex areas of the upland plateau that are usually ground moraine. A dense, compact fragipan is in the lower part of the subsoil. Areas of this soil are generally elongated or irregular in shape and range from 3 to 100 acres or more.

Typically, this soil has a surface layer of dark grayish brown channery silt loam 8 inches thick. The subsoil above the fragipan is about 10 inches thick. It is yellowish brown channery silt loam in the upper part and mottled, light brownish gray channery silt loam in the lower part. The firm and dense fragipan is about 24 inches thick. It is mottled, light olive brown channery silt loam in the upper part and mottled, dark grayish brown channery silt loam in the lower part. The substratum to a depth of 60 inches is grayish brown channery silt loam.

Included with this soil in mapping are small areas of the Erie and Mardin soils. The Erie soils are somewhat poorly drained and are in a few level areas and along some drainageways. The Mardin soils are similar to this Langford soil but are more acid and do not have an accumulation of clay in the fragipan. Also included are some areas that are nearly level and a few areas of the sloping Langford soils. Isolated wet spots and springs are common and are indicated by special symbols on the soil map. In some places, the surface layer is silty and stone-free. Areas of included soils range from 1/4 acre to 3 acres.

In the spring this Langford soil has a perched water table above the dense fragipan. Permeability is moderate above the fragipan and slow or very slow in and below the fragipan. Water commonly moves laterally downslope along the top of the fragipan. The available water capacity is moderate, and runoff is medium. Channery fragments make up 15 to 30 percent of the surface layer. Bedrock is generally many feet deep, but may be as little as 5 feet deep. The surface layer and upper part of the subsoil are strongly acid to neutral.

This soil is moderately suited to farming but has limitations for many urban uses. Most areas are farmed, are in woodland, or are idle.

This Langford soil is moderately suited to cultivated crops. Subsurface drainage of wet spots and diversion ditches are needed in many fields. Channery fragments can hinder tillage, planting fine-seeded crops, and harvesting some crops, such as potatoes. Erosion is a hazard on long slopes. Keeping tillage to a minimum, using cover crops, tilling on the contour, and including grasses and legumes in the cropping system help maintain good tilth, increase the organic matter content, and improve crop yields. With adequate drainage of wet spots, seep spots, and field drainageways, this soil is suitable for many crops, particularly corn, small grains, and hay.

This soil is also well suited to pasture. Overgrazing is a major concern of pasture management because it can cause the loss of the pasture seeding. Grazing when the soil is wet early in the spring is also a problem because it can lead to soil compaction and trampling of forage plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet help maintain high quality pasture.

The potential of this soil for wood crops is fair to good. Equipment limitations, erosion hazard, seedling mortality, and uprooting of trees during windstorms are usually not problems on this soil. Seedlings should be planted early in the spring when the soil is moist.

The temporary seasonal wetness, slow or very slow permeability in the fragipan, high potential frost-heave, and small stones are limitations for many urban uses of this Langford soil. Drains around foundations and interceptor drains that divert runoff and seepage minimize the seasonal wetness. Strength of this soil is high, but flat stones may hinder construction and make seeding of lawns and fairways difficult. The fragipan can be somewhat difficult to excavate. Many areas are good sites for diked ponds.

This Langford soil is in capability subclass IIw.

LfC—Langford channery silt loam, 8 to 15 percent slopes. This sloping soil is deep and well drained and moderately well drained. It formed in glacial till deposits derived mainly from limestone and shale. This soil is on smooth, somewhat convex side slopes on the upland plateau. A dense, compact fragipan is in the lower part of the subsoil. Areas of this soil are generally elongated and range from 3 to 100 acres.

Typically, this soil has a surface layer of dark grayish brown channery silt loam 8 inches thick. The subsoil above the fragipan is about 10 inches thick. It is yellowish brown channery silt loam in the upper part and mottled, light brownish gray channery silt loam in the lower part. The firm and dense fragipan is about 24 inches thick. It is mottled, light olive brown channery silt loam in the upper part and mottled, dark grayish brown channery silt loam in the lower part. The substratum to a depth of 60 inches is grayish brown channery silt loam.

Included with this soil in mapping are small areas of the Erie and Mardin soils. The Erie soils are somewhat poorly drained and are on a few foot slopes and along some drainageways. The Mardin soils are similar to this Langford soil, but they are more acid and do not have an accumulation of clay in the fragipan. Also included are some areas that are gently sloping, and a few areas of the moderately steep Langford soils. Isolated wet spots and springs are common and are indicated by special symbols on the soil map. In some places, the surface layer is silty and channery-free. Areas of included soils range from 1/4 acre to 3 acres.

In the spring this Langford soil has a perched water table above the dense fragipan. Permeability is moderate above the fragipan and slow or very slow in and below the fragipan. Water commonly moves laterally downslope along the top of the fragipan. The available water capacity is moderate, and runoff is rapid. Channery fragments make up 15 to 30 percent of the surface layer. Bedrock is generally many feet deep, but may be as little as 5 feet deep. The surface layer and upper part of the subsoil are strongly acid to neutral.

This soil is moderately suited to farming but has limitations for may urban uses. Most of the acreage is farmed, is in woodland, or is idle.

This Langford soil is moderately suited to cultivated crops. Erosion is a serious hazard on long slopes and in intensively cultivated areas. Subsurface drainage of wet spots and diversion ditches are needed in many fields. Channery fragments can hinder tillage, planting fine-seeded crops, and harvesting some crops, such as potatoes. Keeping tillage to a minimum, using cover crops, tilling on the contour, stripcropping, and including grasses and legumes in the cropping system help maintain good tilth, control erosion, increase organic matter content, and improve crop yields. With adequate drainage of wet spots, seep spots, and field drainageways, this soil can be used for many crops, particularly corn, small grains, and hay.

This soil is well suited to pasture and hay crops. Overgrazing is a major concern in pasture management because it can cause the loss of the pasture seeding. Grazing when the soil is wet early in the spring can lead to soil compaction and trampling of forage plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet help maintain high quality pasture.

The potential of this soil for wood crops is fair to good. Equipment limitations, erosion hazard, seedling mortality, and uprooting of trees during windstorms are usually not problems. Seedlings should be planted early in the spring when the soil is moist.

The temporary seasonal wetness, slow or very slow permeability in the fragipan, slope, high potential frost heave, and small stone fragments are limitations for many urban uses of this Langford soil. Drains around foundations and interceptor drains that divert runoff and seepage minimize the seasonal wetness problem. The strength of this soil is high, but flat stones may hinder construction and make seeding of lawns and fairways difficult. The fragipan can be somewhat difficult to excavate. Some areas are sites for diked ponds.

This Langford soil is in capability subclass IIIe.

LfD—Langford channery silt loam, 15 to 25 percent slopes. This moderately steep soil is deep and well drained and moderately well drained. It formed in glacial till deposits derived mainly from limestone and shale. This soil is on smooth hillsides and valley sides on the upland plateau. Runoff is commonly received from higher adjacent soils. A dense, compact fragipan is in the lower part of the subsoil. Areas of this soil are generally oblong or elongated and range from 3 to 100 acres.

Typically, this soil has a surface layer of dark grayish brown channery silt loam 8 inches thick. The subsoil above the fragipan is about 10 inches thick. It is yellowish brown channery silt loam in the upper part and mottled, light brownish gray channery silt loam in the lower part. The firm and dense fragipan is about 24 inches thick. It is mottled, light olive brown channery silt loam in the upper part and mottled, dark grayish brown channery silt loam in the lower part. The substratum to a depth of 60 inches is grayish brown channery silt loam.

Included with this soil in mapping are small areas of the Erie and Mardin soils. The Erie soils are somewhat poorly drained and are on a few foot slopes. The Mardin soils are similar to this Langford soil, but they are more acid and do not have an accumulation of clay in the fragipan. Also included are some areas of the sloping Langford soils. Isolated wet spots and springs are common and are indicated by special symbols on the soil map. In some places, narrow areas of bedrock are within 5 feet of the surface. Areas of included soils range from 1/2 acre to 3 acres.

In the spring this Langford soil has a perched water table above the dense fragipan. This soil is usually somewhat better drained than the less sloping Langford soils. Permeability is moderate above the fragipan and slow or very slow in and below the fragipan. Water commonly moves laterally downslope along the top of the fragipan. The available water capacity is moderate, and runoff is rapid to very rapid. Channery fragments make up 15 to 30 percent of the surface layer. Bedrock is generally many feet deep, but may be as little as 5 feet deep. The surface layer and upper part of the subsoil are strongly acid to neutral.

This soil has some limitations for farming and serious limitations for many urban uses. Most of the acreage is in woodland, or it is idle. Some areas of this soil are in hay or pasture.

This Langford soil can be used for cultivated crops, but erosion is a very serious hazard. The moderately steep slopes make the use of farm equipment somewhat difficult. Interceptor drains and diversion ditches are needed in many fields. Channery fragments can hinder tillage, planting fine-seeded crops, and harvesting some crops, such as potatoes. If cultivated crops are grown, it should be infrequently, and a maximum of conservation practices should be used. Keeping tillage to a minimum, using cover crops, tilling on the contour, stripcropping, and frequently including grasses and legumes in the cropping system help maintain good tilth, improve organic matter content, and help control erosion.

This soil is well suited to pasture and hay. Reseeding, applying fertilizer and lime, and harvesting hay crops can be somewhat difficult because of the moderately steep slopes. Overgrazing is a major concern of pasture management because it can cause the loss of the pasture seeding and increase the hazard of erosion. Grazing when the soil is wet early in the spring can lead to soil compaction and trampling of forage plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet help maintain high quality pasture.

The potential of this soil for wood crops is fair to good. The use of planting and harvesting equipment is somewhat limited by slope. Seedling mortality and uprooting of trees during windstorms are usually not problems. Although erosion is usually not a hazard in wooded areas, placing logging trails across the slope minimizes trail gullying.

The moderately steep slopes, slow or very slow permeability in the fragipan, and high potential frost heave are serious limitations for most urban uses of this Langford soil. Interceptor drains are needed to divert runoff and seepage from foundations. Slopes are so steep that there are few good building sites, and the fragipan can be somewhat difficult to excavate. Roads on this soil are usually subject to frost heave. Some places are good sites for the development of woodland wildlife habitat.

This Langford soil is in capability subclass IVe.

LgC—Langford channery silt loam, silty substratum, 8 to 15 percent slopes. This sloping soil is deep and well drained and moderately well drained. It formed in glacial till deposits underlain by lake-laid silt and clay at a depth of 3 to 7 feet. This soil is on smooth, somewhat convex side slopes along lower valley sides on the upland plateau. Many areas are near lateral moraines. A dense, compact fragipan is in the lower part of the subsoil. Areas of this soil are generally irregular in shape and range from 3 to 100 acres.

Typically, this soil has a surface layer of dark grayish brown channery silt loam 6 inches thick. The subsoil above the fragipan is about 10 inches thick. It is yellowish brown channery silt loam in the upper part and mottled, light brownish gray channery silt loam in the lower part. The firm and dense fragipan is about 24 inches thick. It is mottled, light olive brown channery silt loam in the upper part and mottled, dark grayish brown channery silt loam in the lower part. The substratum to a depth of 60 inches is grayish brown silt loam that is nearly free of gravel and channery.

Included with this soil in mapping are small areas of the Darien, Varysburg, and Hudson soils. The Darien soils are somewhat poorly drained and are on a few foot slopes. The Varysburg soils formed in gravelly deposits underlain by clayey sediments. The Hudson soils formed in lake-laid silts and clays that do not have a glacial till mantle. Also included are some areas that are gently sloping and a few areas of the moderately steep Langford soils. Isolated wet spots and springs are common and are indicated by special spot symbols on the soil map. Areas of included soils range from 1/2 acre to 3 acres.

In the spring this Langford soil has a perched water table above the dense fragipan. Permeability is moderate above the fragipan and slow or very slow in the fragipan and silty substratum. Water commonly moves laterally downslope along the top of the fragipan. The available water capacity is moderate, and runoff is rapid. Channery fragments make up 15 to 30 percent of the surface layer. Bedrock is generally many feet deep, but may be as little as 5 feet deep. The surface layer and upper part of the subsoil are strongly acid to neutral.

This soil is moderately suited to farming but has limitations for many urban uses. Most of the acreage is farmed or wooded, or it is idle.

This Langford soil is moderately suited to cultivated crops. Erosion is a serious hazard on long slopes and in intensively cultivated areas. Subsurface drains and diversion ditches are needed in many fields. Channery fragments can hinder tillage, planting fine-seeded crops, and harvesting some crops, such as potatoes. Keeping tillage to a minimum, using cover crops, tilling on the contour, stripcropping, and including grasses and legumes in the cropping system help maintain good tilth, control erosion, increase the organic matter content, and improve crop yields. If wet spots, seep spots and field drainageways are adequately drained, this soil can be used for many crops, particularly corn, small grains, and hay.

This soil is well suited to pasture and hay crops. Overgrazing is a major concern of pasture management because it can reduce plant growth and can cause the loss of the seeding. Grazing when the soil is wet early in the spring can lead to soil compaction and trampling of forage plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet help maintain high quality pasture.

The potential of this soil for wood crops is fair to good. Equipment limitations, erosion hazard, seedling mortality, and uprooting of trees during windstorms are usually not problems. Seedlings should be planted early in the spring when the soil is moist. On logging trails, deep cuts into the silty substratum can lead to mass slumps or slides.

The temporary seasonal wetness, unstable silty substratum, slow or very slow permeability in the fragipan, slope, high potential frost heave, and small stones are serious limitations for many urban uses of this Langford soil. Drains around foundations and interceptor drains that divert runoff and seepage minimize wetness. Excavating foot slopes or undercutting side slopes can cause hazardous slides or slumps because the substratum is unstable and silty. These silty sediments are poor support for foundations of buildings, and the fragipan is somewhat difficult to excavate. Flat stones can hinder construction and make seeding of lawns and fairways difficult. Most areas are poor pond sites because of the unstable substratum.

This Langford soil is in capability subclass IIIe.

LgD—Langford channery silt loam, silty substratum, 15 to 25 percent slopes. This moderately steep soil is deep and well drained and moderately well drained. It formed in glacial till deposits underlain by lake-laid silt and clay at a depth of 3 to 7 feet. It is on the lower part of dissected sides of valleys on the upland plateau. Most areas are near lateral moraines. Runoff is commonly received from higher adjacent soils. A dense, compact fragipan is in the lower part of the subsoil. Areas of this soil are generally oblong or elongated and range from 3 to 50 acres or more.

Typically, this soil has a surface layer of dark grayish brown channery silt loam 6 inches thick. The subsoil above the fragipan is about 10 inches thick. It is yellowish brown channery silt loam in the upper part and mottled, light brownish gray channery silt loam in the lower part. The firm and dense fragipan is about 24 inches thick. It is mottled, light olive brown channery silt loam in the upper part and mottled, dark grayish brown channery silt loam in the lower part. The substratum to a depth of 60 inches is grayish brown silt loam that is nearly free of gravel and stones.

Included with this soil in mapping are small areas of the Hudson and Varysburg soils. The Hudson soils formed in silty and clayey lake-laid sediments that do not have a mantle of loamy glacial till. The Varysburg soils formed in gravelly deposits underlain by silty sediments. In a few areas, there is no fragipan. Also included are some areas of the sloping and very steep Langford soils. Isolated wet spots and springs are common and are indicated by special spot symbols on the soil map. Areas of included soils range from 1/2 acre to 3 acres.

In the spring this Langford soil has a perched water table above the dense fragipan. This soil is usually somewhat better drained than the less sloping Langford soils. Permeability is moderate above the fragipan and slow or very slow in the fragipan and silty substratum. Water commonly moves laterally downslope along the top of the fragipan. The available water capacity is moderate, and runoff is rapid to very rapid. Channery fragments make up 15 to 30 percent of the surface layer. Bedrock is generally many feet deep, but may be as little as 5 feet deep. The surface layer and upper part of the subsoil are strongly acid to neutral.

This soil has some limitations for farming and serious limitations for most urban uses. Most of the acreage is in woodland, or it is idle. A few areas of this soil are in hay or pasture.

This Langford soil can be used for cultivated crops, but erosion is a very serious hazard. The moderately steep slopes make the use of farm equipment somewhat difficult. Interceptor drains and diversion ditches are needed in many fields. Channery fragments can hinder tillage, planting fine-seeded crops, and harvesting some crops, such as potatoes. If cultivated crops are grown, it should be infrequently and a maximum of conservation practices should be used. Keeping tillage to a minimum, using cover crops, tilling on the contour, stripcropping, and frequently including grasses and legumes in the cropping system help maintain good tilth, improve the organic matter content, and help control erosion.

This soil is suited to pasture and hay. Reseeding, applying fertilizer and lime, and harvesting hay crops can be somewhat difficult because of the moderately steep slopes. Overgrazing is a major concern of pasture management because it can cause the loss of the pasture seeding and increase the erosion hazard. Grazing when the soil is wet early in the spring can cause soil compaction and trampling of forage plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet help maintain high quality pasture.

The potential of this soil for wood crops is fair to good. The use of planting and harvesting equipment is somewhat limited by slope. Seedling mortality and uprooting of trees during windstorms are usually not problems. Although erosion is usually not a hazard in wooded areas, placing logging trails across the slope minimizes trail gullying. However, if logging trails are incised too deep, there is a serious hazard of mass soil slumps or slides because of the unstable silty substratum.

The moderately steep slopes, unstable silty substratum, slow or very slow permeability in the fragipan, and high potential frost heave are very serious limitations for most urban uses of this Langford soil. Interceptor drains that divert runoff and seepage minimize the wetness around buildings. Because slopes are steep and the silty substratum is poor support for foundations, there are few good building sites on this soil. Excavating foot slopes or undercutting side slopes can cause hazardous slides because the substratum is silty and unstable. The fragipan is somewhat difficult to excavate. Some places are good sites for the development of woodland wildlife habitat.

This Langford soil is in capability subclass IVe.

LmA—Lima loam, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It formed in calcareous glacial till. This soil is in slightly convex areas on glacial till plains in the northern part of the county. Areas of this soil are usually broad and irregular in shape. They range from 3 to 200 acres, but areas of 5 to 75 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown loam about 9 inches thick. The subsurface layer is mottled, light brownish gray loam about 2 inches thick. The subsoil is mottled, brown silt loam about 15 inches thick. The substratum to a depth of 60 inches or more is mottled, brown gravelly silt loam.

Included with this soil in mapping are small intermingled areas of the Honeoye, Kendaia, and Appleton soils. The Honeoye soils are similar to this Lima soil but are slightly better drained and are on convex knolls. The somewhat poorly drained Kendaia and Appleton soils are in a few slight depressions and areas that accumulate runoff. The Kendaia soils do not have the clay accumulation in the subsoil that is in the Lima soil. Also included are significant areas of soil that is better drained than the Lima soil and has a dark surface layer. Areas of included soils range from 1/4 acre to 3 acres.

In the spring this Lima soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is moderate in the surface layer and subsoil and very slow or slow beneath. The available water capacity is moderate to high, and runoff is slow to medium. Gravel makes up 5 to 15 percent of the surface layer. Bedrock is at a depth of more than 5 feet. The surface layer and subsoil range from medium acid to mildly alkaline.

This soil is suited to farming but has some limitations for many urban uses. Most of the acreage is farmed, and some areas are in urban uses.

This Lima soil is suited to cultivated crops. Occasional surface stones can be slightly bothersome for some tillage operations and in cultivating some crops. Removing occasional cobblestones and stones is a common yearly practice in intensively cultivated areas. Drainage of included wet spots makes the use of many fields more efficient, but drains are difficult to install in this nearly flat soil. Temporary wetness can slightly delay normal tillage operations in the spring. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops improve tilth and help maintain the organic matter content.

The soil is also well suited to pasture and hay. Overgrazing can lead to restricted plant growth and to the eventual loss of the seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs. Liming requirements are generally low on this soil.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Machine planting of tree seedlings is practical on large areas of this soil. Erosion hazard, equipment limitations, seedling mortality, and windthrow hazard are generally not problems.

The slow or very slow permeability in the substratum, temporary seasonal wetness, and moderate risk of frost damage are some limitations for urban uses of this soil. If the soil is used for septic tank absorption fields, specially designed systems may be needed to overcome the very slow permeability. Drains around foundations of dwellings minimize the problem of temporary wetness in the spring. Proper grading and landscaping of building sites allow for proper runoff and surface drainage around structures and dwellings. Some areas are good sites for recreational uses, particularly uses requiring a nearly level site.

This Lima soil is in capability subclass IIw.

LmB—Lima loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in calcareous glacial till. This soil is in smooth, slightly convex and undulating areas of glacial till plains in the northern part of the county. Areas of this soil are usually circular or irregular in shape and range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown loam about 9 inches thick. The subsurface layer is mottled, light brownish gray loam about 2 inches thick. The subsoil is mottled, brown silt loam about 15 inches thick. The substratum to a depth of 60 inches or more is mottled, brown gravelly silt loam.

Included with this soil in mapping are small intermingled areas of the Honeoye, Kendaia, and Appleton soils. The Honeoye soils are similar to this Lima soil but are slightly better drained and are on convex knolls. The somewhat poorly drained Kendaia and Appleton soils are in a few slight depressions, along drainageways, and in areas that accumulate runoff. The Kendaia soils do not have the clay accumulation in the subsoil of the Lima soil. Also included are significant areas of soil that is better drained than the Lima soil and has a dark surface layer. Areas of included soils range from 1/4 acre to 3 acres.

In the spring this Lima soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is moderate in the surface layer and subsoil and very slow or slow in the substratum. The available water capacity is moderate to high, and runoff is medium. Gravel makes up 5 to 15 percent of the surface layer. Bedrock is at a depth of more than 5 feet. The surface layer and subsoil range from medium acid to mildly alkaline.

This soil is suited to farming but has some limitations for urban uses. Most of the acreage is farmed, and some areas are in urban uses.

This Lima soil is suited to cultivated crops. Erosion is a hazard in intensively cultivated areas and on long slopes. Occasional surface stones can be slightly bothersome for some tillage operations and in cultivating some crops. Removing occasional cobblestones and stones is a common yearly practice in intensively cultivated areas. Drainage of included wet spots makes more efficient use of some fields possible. Temporary wetness can slightly delay normal tillage operations in the spring. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops improve tilth, help maintain the organic matter content, and reduce the hazard of erosion.

The soil is also well suited to pasture and hay. Overgrazing can lead to restricted plant growth and to the eventual loss of the seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs. Liming requirements are generally low on this soil.

The potential of this soil for wood crops is good, but only a small acreage is wooded. Machine planting of tree seedlings is practical in large areas of this soil. Erosion hazard, equipment limitations, seedling mortality, and windthrow hazard are generally not problems. Placing logging trails across the slope reduces the hazard of trail gullying or erosion.

The slow or very slow permeability in the substratum, temporary seasonal wetness, and moderate risk of frost damage are some limitations for urban uses of this soil. If the soil is used for septic tank absorption fields, specially designed systems may be needed to overcome the slow or very slow permeability. Drains around foundations and interceptor drains placed upslope from dwellings minimize the temporary wetness and seepage in the spring. Proper grading and landscaping of building sites allow for proper runoff and surface drainage around structures. Some areas provide good sites for recreational uses, such as picnic areas and hiking trails.

This Lima soil is in capability subclass IIe.

Ly—Lyons silt loam. This nearly level soil is deep and poorly drained. This soil is along drainageways or in flat areas on glacial till plains. Slope is 0 to 3 percent. Areas of this soil are irregular in shape and range from 3 to 40 acres.

Typically, this soil has a surface layer of very dark brown silt loam about 9 inches thick. The subsoil is about 23 inches thick. It is brown to dark brown silt loam in the upper part and grayish brown heavy silt loam in the lower part. The substratum extends to a depth of 65 inches or more. It is brown heavy silt loam in the upper part and dark grayish brown silty clay loam in the lower part.

Included with this soil in mapping are small areas of the Canandaigua, Appleton, and Kendaia soils. The Canandaigua soils have no gravel in the lower part of the subsoil, whereas the Lyons soil is gravelly throughout. The Appleton and Kendaia soils are on slightly higher, better drained rises and low knolls. Included are some areas where free carbonates are more than 40 inches deep, and some small areas where the surface layer is mucky usually near the center of depressions. Areas of included soils range up to 3 acres.

This Lyons soil has a perched water table at or near the soil surface from November through June. Permeability is moderate or moderately slow in the subsoil and slow or very slow in the substratum. The available water capacity is moderate to high, and runoff is very slow. Gravel makes up 0 to 15 percent of the surface layer. Depth to bedrock is generally more than 5 feet deep. The surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

Because of prolonged wetness, this Lyons soil has limited suitability for farmland and is poorly suited to urban uses. Most of the acreage is in woods or is idle. A few areas are pastured.

This Lyons soil is poorly suited to cultivated crops, unless adequately drained. Prolonged wetness delays planting until early summer in undrained areas. Drainage outlets are difficult to locate because this soil is low on the landscape. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops improve tilth and help maintain the organic matter in drained areas.

This soil is also poorly suited to pasture unless it is partially drained. Grazing when the soil is wet is the major concern of pasture management because it can cause soil compaction and trampling of pasture plants and can eventually lead to the loss of the seeding. Forage plants that can withstand a prolonged high water table are best suited to this soil.

This soil is mostly wooded, but its potential for wood crops is poor. Prolonged wetness seriously limits the use of equipment, increases seedling mortality, and results in shallow rooting, which can lead to more uprooting of trees during windstorms. Seedlings that can withstand a high water table are best suited to this soil.

The prolonged high water table, slow or very slow permeability in the substratum, and high risk of frost damage are very serious limitations for urban uses of this soil. Basements are difficult to keep dry, and buildings without basements and roads are subject to frost heave. Some areas are suitable for dugout ponds, while other areas are good sites for the development of wildlife marshes.

This Lyons soil is in capability subclass IVw.

Lz—Lyons mucky silt loam. This nearly level soil is deep and very poorly drained. It is in depressions on upland glacial till plains. Slope is 0 to 2 percent. Areas of this soil are rounded or irregular in shape and range from 3 to 30 acres.

Typically, this soil has a surface layer of very dark brown mucky silt loam about 9 inches thick. The subsoil is about 23 inches thick. It is brown to dark brown silt loam in the upper part and grayish brown heavy silt loam in the lower part. The substratum to a depth of 65 inches or more is brown heavy silt loam in the upper part and dark grayish brown silty clay loam in the lower part.

Included with this soil in mapping are small areas of the Canandaigua, Ilion, and Palms soils. The Canandaigua soils have no gravel in the lower part of the subsoil, whereas the Lyons soil is gravelly throughout. The Ilion soils have a higher clay content in the subsoil than this Lyons soil, and the Palms soils are in the center of depressions that have a mucky surface layer thicker than 16 inches. Included also are some areas where free carbonates are more than 40 inches deep and some small areas, usually near the outer edge of depressions, where the surface layer is not mucky. Areas of included soils range up to 3 acres.

This Lyons soil has a perched water table at or near the surface from November through June. Some areas are ponded in the spring. Permeability is moderate or moderately slow in the subsoil and slow or very slow in the substratum. The available water capacity is high, and runoff is very slow to ponded. Gravel makes up 0 to 15 percent of the surface layer. Depth to bedrock is generally more than 5 feet. The surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

Because of prolonged wetness, this Lyons soil has limited suitability for farming and is poorly suited to urban uses. Most of the acreage is in woods, or it is idle.

This Lyons soil is poorly suited to cultivated crops unless adequately drained. Prolonged wetness and ponding delay planting until early summer in undrained areas. Drainage outlets are often extremely difficult to locate because this soil is very low on the landscape. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth and organic matter content in drained areas.

This soil is also poorly suited to pasture unless it is partially drained. Reseeding is usually not possible in undrained areas. Grazing when the soil is wet is the major concern of pasture management because it can cause soil compaction and trampling of pasture plants. In partially drained areas, forage plants that can withstand a prolonged high water table are best suited to this soil.

This soil is mostly wooded, but its potential for wood crops is poor. Prolonged wetness seriously limits the use of equipment, causes high seedling mortality, and results in shallow rooting, which can lead to the uprooting of trees during windstorms. Seedlings that can withstand a prolonged high water table are best suited to this soil.

The prolonged high water table and occasional ponding, slow or very slow permeability in the substratum, and high potential frost action are very serious restrictions for urban uses of this soil. Some areas are suitable for dugout ponds, and many areas are well suited to the development of wildlife marshes.

This Lyons soil is in capability subclass IVw.

MaA—Manlius shaly silt loam, 0 to 3 percent slopes. This nearly level soil is moderately deep and well drained to excessively drained. It formed in glacial till deposits derived from shale bedrock. This soil is on slightly elevated, nearly flat benches on the fringe of the upland plateau where the topography is influenced by the underlying bedrock. Areas of this soil are oval or oblong and range from 5 to 100 acres or more, but areas of 10 to 30 acres are most common. There are few drainageways because this soil receives little runoff from adjacent areas.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 8 inches thick. The subsoil, to a depth of 21 inches, is yellowish brown very shaly silt loam. The substratum, to a depth of 31 inches, is brown very shaly silt loam. It is underlain by brittle, very dark grayish brown to dark gray, shale bedrock.

Included with this soil in mapping are small areas of the Orpark, Marilla, and Farnham soils. The Marilla and Farnham soils are moderately well drained and are underlain by bedrock that is more than 40 inches deep. The Marilla soils have a dense fragipan in the subsoil. The Orpark soils are somewhat poorly drained and are usually in slight depressions that are indicated on the soil map by a special symbol for wetness. Also included are some very large areas of a soil that is similar to the Manlius soil, is moderately well drained, and has a seasonal high water table above bedrock early in the spring. Areas of included soils range from 1/4 acre to 3 acres.

In this Manlius soil the seasonal high water table is usually at a depth of 5 feet or more, but many areas include soils that have a seasonal high water table above bedrock early in the spring. Permeability of the Manlius soil is moderate. The available water capacity is low, and runoff is slow. Bedrock is at a depth of 20 to 40 inches. Shale fragments make up 15 to 35 percent of the surface layer. Unless limed, the surface layer is extremely acid to strongly acid.

This soil is moderately suited to farming but poorly suited to many urban uses. Most of the acreage is cultivated or is in hay, pasture, or woodland. Some areas are idle.

Although this Manlius soil is moderately suited to farming, droughtiness is often a problem in midsummer. Seasonal wetness of the included soils can delay tillage of some fields. Subsurface drainage is often difficult to install in these included wet soils because of the underlying bedrock. In cultivated areas, keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system help maintain tilth and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. Because this soil is naturally low in fertility and is quite acid, liberal applications of fertilizer and lime are needed for most crops.

This soil is suited to hay and pasture. Plants that can withstand droughtiness during the summer are the most desirable. Pastures should not be overgrazed when the soil is dry because this can lead to the loss of the seeding. Liberal applications of lime improve most pastures.

The potential of this soil for wood crops is fair. Erosion is not a hazard, and there are few limitations for the use of planting and harvesting equipment. Trees that can withstand acid conditions and summer droughtiness are best suited to this soil.

The moderate depth to shale bedrock is the main limitation to urban uses of this soil. Seasonal wetness is also a problem in areas that include more poorly drained soils. Because this Manlius soil is droughty, frequent watering and adequate liming are usually needed to establish lawns. Some areas are suited to recreational uses, such as campsites or picnic areas, but small stones can be a minor limitation.

This Manlius soil is in capability subclass IIs.

MaB—Manlius shaly silt loam, 3 to 8 percent slopes. This gently sloping soil is moderately deep and well drained to excessively drained. It formed in glacial till deposits derived from shale bedrock. This soil is on the sides of slightly elevated benches or rises on the fringe of the upland plateau where the topography is influenced by the underlying bedrock. Areas of this soil are oval or elongated and range from 5 to 100 acres, but areas of 15 to 25 acres are most common.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 8 inches thick. The subsoil extends to a depth of 21 inches and is yellowish brown very shaly silt loam. The substratum, to a depth of 31 inches, is brown very shaly silt loam. It is underlain by brittle, very dark grayish brown to very dark gray, shale bedrock.

Included with this soil in mapping are small areas of the Orpark and Marilla soils. The Marilla soils are moderately well drained, have a dense fragipan in the subsoil, and are underlain by bedrock that is more than 40 inches deep. The Orpark soils are somewhat poorly drained and usually are in slight depressions or on foot slopes. They are indicated on the soil map by a special symbol for wetness. Also included are some very large areas of a soil that is similar to this Manlius soil, but it is nearly level and moderately well drained and has a seasonal high water table above bedrock early in the spring. Areas of included soils range from 1/2 acre to 3 acres.

In this Manlius soil the seasonal high water table is usually at a depth of 5 feet or more, but many areas included soils that have a seasonal high water table above the bedrock early in the spring. Permeability of the Manlius soil is moderate. The available water capacity is low, and runoff is medium to slow. Bedrock is at a depth of 20 to 40 inches. Shale fragments make up 15 to 35 percent of the surface layer. Unless limed, the surface layer and subsoil are extremely acid to strongly acid.

This soil is only moderately suited to farming and poorly suited to many urban uses. Most of the acreage is cultivated, is in hay, pasture, or woodland, or is idle.

Although this Manlius soil is moderately suited to farming, droughtiness is often a serious problem in midsummer. Erosion can be a hazard in intensively cultivated areas. Shale fragments can be a problem in planting fine-seeded crops and can cause machinery to wear at a more rapid rate. Seasonal wetness of the included soils can delay tillage of some fields. Subsurface drains are usually difficult to install in these included wet soils because of the underlying bedrock. In cultivated areas, keeping tillage to a minimum, using cover crops, tilling across slopes, and including grasses and legumes in the cropping system help maintain tilth, control erosion, and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. Because this soil is naturally low in fertility and is quite acid, liberal applications of fertilizer and lime are needed for most crops.

This soil is suited to hay and pasture. Plants that can withstand droughtiness during the summer are the most desirable. Pastures should not be overgrazed when the soil is dry because this can lead to the loss of the seeding. Liberal applications of lime improve most pastures.

The potential of this soil for wood crops is fair. Erosion is usually not a hazard, and there are few limitations for the use of planting and harvesting equipment. Trees that can withstand acid conditions and summer droughtiness are best suited to this soil.

The moderate depth to shale bedrock is the main limitation to urban uses of this soil. Erosion is a slight hazard during construction. Seasonal wetness is also a problem in areas that include more poorly drained soils. Because this Manlius soil is droughty, frequent watering and adequate liming are usually needed to establish lawns. Some areas are suited to recreational uses, such as campsites or picnic areas, but small stones can be a minor limitation.

This Manlius soil is in capability subclass IIe.

MaC—Manlius shaly silt loam, 8 to 15 percent slopes. This sloping soil is moderately deep and well drained to excessively drained. It formed in glacial till deposits derived from shale bedrock. This soil is on the sides of ridges and crests of benches on the fringe of the upland plateau where the topography is influenced by the underlying bedrock. Areas of this soil are elongated or crescent shaped and range from 3 to 30 acres, but areas of 10 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 8 inches thick. The subsoil, which extends to a depth of 21 inches, is yellowish brown very shaly silt loam. The substratum, to a depth of 31 inches, is brown very shaly silt loam. It is underlain by brittle, very dark grayish brown to dark gray, shale bedrock.

Included with this soil in mapping are small areas of the Orpark and Marilla soils. The Marilla soils are moderately well drained and are underlain by bedrock that is more than 40 inches deep. The Orpark soils are somewhat poorly drained and usually are on foot slopes and along drainageways. These areas are indicated on the soil map by special symbols for wetness and drainageways. Included are some areas where bedrock is shallower than 20 inches. The gently sloping Manlius soils are included on shoulder slopes on the fringe of this map unit. Areas of included soils range from 1/2 acre to 3 acres.

This Manlius soil usually has a seasonal high water table at a depth of more than 5 feet. Permeability is moderate. The available water capacity is low, and runoff is medium to rapid. Bedrock is at a depth of 20 to 40 inches. Shale fragments make up 15 to 35 percent of the surface layer. Unless limed, the surface layer and subsoil are extremely acid to strongly acid.

This soil has limited suitability for farming and is poorly suited to many urban uses. Most of the acreage is in hay, pasture, or woodland, or it is idle.

This Manlius soil has limited suitability for cultivated crops because of droughtiness, slope, and the associated erosion hazard. Areas of included wet soils can delay early-season tillage of some fields. Subsurface drainage is often difficult to install in these included wet spots because of the underlying bedrock. Shale fragments interfere with planting of some fine-seeded crops and cause more rapid wear of equipment. In cultivated areas, keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system help maintain tilth and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. These practices and tilling across slopes and stripcropping help control erosion. Because this soil is naturally low in fertility and is quite acid, liberal applications of fertilizer and lime are needed for most crops.

This soil is moderately suited to hay and pasture. Plants that can withstand droughtiness during the summer are the most desirable. Pastures should not be overgrazed when the soil is dry because this can lead to the loss of the seeding and increase the hazard of erosion. Liberal applications of lime improve most pastures.

The potential of this soil for wood crops is fair. Erosion is usually not a hazard, and there are generally few limitations for the use of planting and harvesting equipment. Placing logging trails on the contour reduces the hazard of trail gullying. Trees that can withstand acid conditions and summer droughtiness are the best suited to this soil.

The moderate depth to shale bedrock and slope are the main limitations to urban uses of this soil. Seasonal wetness is also a problem in areas that include more poorly drained soils. Erosion can be a serious hazard in areas under construction. It can be controlled by revegetating the site during or soon after construction. Because of droughtiness, frequent watering and adequate liming are usually needed to establish lawns.

Some areas are suited to recreational uses, such as hiking trails, campsites, or picnic areas, but small stones and slope can be minor limitations.

This Manlius soil is in capability subclass IIIe.

MaD—Manlius shaly silt loam, 15 to 25 percent slopes. This moderately steep soil is moderately deep and well drained to excessively drained. It formed in glacial till deposits derived from shale bedrock. This soil is on hillsides, upper valley sides, and sides of dissected gullies on the fringe of the upland plateau where the topography is influenced by the underlying bedrock. Most areas of this soil are elongated. They range from 3 to 100 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 8 inches thick. The subsoil, to a depth of 21 inches, is yellowish brown very shaly silt loam. The substratum, to a depth of 31 inches, is brown very shaly silt loam. It is underlain by brittle, very dark grayish brown to dark gray, shale bedrock.

Included with this soil in mapping are small areas of the Blasdell, Aurora, and Schuyler soils. The Blasdell soils are included in areas where this soil merges with shaly outwash deposits. The Aurora soils are more loamy and have a lower shale fragment content than the Manlius soil. The Schuyler soils are underlain by bedrock at a depth of 40 inches or more. In many areas bedrock is at a depth of 20 inches or less. Areas of included soils range from 1/4 acre to 3 acres.

This Manlius soil usually has a seasonal high water table at a depth of more than 5 feet. Permeability is moderate. The available water capacity is low, and runoff is rapid. Bedrock is at a depth of 20 to 40 inches. Shale fragments make up 15 to 35 percent of the surface layer. Unless limed, the surface layer and subsoil are extremely acid to strongly acid.

This soil has very limited suitability for farming and is poorly suited to most urban uses. Most of the acreage is in woodland, or it is idle. Some areas are pastured or in hay.

This soil is poorly suited to cultivated crops because of moderately steep slopes, serious erosion hazard, and droughtiness. Shale fragments are also bothersome for planting fine-seeded crops and cause more rapid wear of machinery. The operation of equipment is somewhat difficult because of slope. If cultivated crops are grown, it should be infrequently, and a maximum of conservation practices should be used, such as keeping tillage to a minimum, using cover crops, frequently including grasses and legumes in the cropping system, tilling across slopes, and stripcropping. Many of these practices also help maintain tilth and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. Because this soil is naturally low in fertility and is quite acid, liberal applications of fertilizer and lime are needed for most crops.

This soil can be used for hay crops, but harvesting is somewhat difficult because of slope. Pasture plants that can withstand droughtiness during the summer are the most desirable. Pastures should not be overgrazed when the soil is dry because this can lead to the loss of the seeding and result in serious erosion. Liberal applications of lime improve most pastures.

The potential of this soil for wood crops is fair. Erosion is a hazard, and the moderately steep slopes seriously limit the use of planting and harvesting equipment. Trees that can withstand acid conditions and summer droughtiness are best suited to this soil.

The moderate depth to shale bedrock and moderately steep slopes are the main limitations to urban uses of this soil. Erosion is a very serious hazard in disturbed areas. Exposed areas should be revegetated as soon as possible to minimize the hazard of erosion. Construction is very difficult on this soil because of the slope. Because of the droughtiness, frequent watering and adequate liming are usually needed to establish lawns. Some areas are suited to hiking and riding trails.

This Manlius soil is in capability subclass IVe.

MbE—Manlius very shaly silt loam, 25 to 35 percent slopes. This steep soil is well drained to excessively drained. It formed in glacial till deposits derived from shale bedrock. This soil is on hillsides and sides of valleys on the fringe of the upland plateau where the topography is influenced by the underlying bedrock. Many areas along the valleys are deeply dissected by V-shaped gullies. Slopes are usually smooth and convex. Areas of this soil are elongated or oblong and range from 3 to 100 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of dark grayish brown very shaly silt loam about 4 inches thick. The subsoil, to a depth of 20 inches, is friable, yellowish brown very shaly silt loam. The substratum, to a depth of 25 inches, is brown very shaly silt loam. It is underlain by shale bedrock.

Included with this soil in mapping are small areas of the Blasdell, Aurora, and Schuyler soils. The Blasdell soils are in areas where this soil merges with shaly outwash deposits. The Aurora soils are more loamy and have a lower shale fragment content than the Manlius soil. The Schuyler soils are underlain by bedrock at a depth of more than 40 inches. In many areas, bedrock is within 20 inches of the soil surface, and in a few areas, it outcrops. Also included are small areas of the less sloping Manlius soils. Areas of included soils range from 1/4 acre to 3 acres.

This Manlius soil usually has a seasonal high water table at a depth of 5 feet or more. Permeability is moderate. The available water capacity is low, and runoff is rapid to very rapid. Bedrock is at a depth of 20 to 40 inches. Shale fragments make up 35 to 40 percent of the surface layer. Unless limed, the surface layer and subsoil are extremely acid to strongly acid.

This soil is not suited to farming and urban uses. Most of the acreage is in woodland. Some areas are idle, and a few areas are pastured.

This Manlius soil is not suited to cultivated crops or hay crops. Steep slopes, a very serious erosion hazard, moderate depth to bedrock, and droughtiness are the main limitations. Slopes are too steep for the safe operation of farm equipment.

Some areas can be used for pasture, but pasture improvement is difficult because of the slope. Pastures are generally of poor quality because the soil is droughty. Overgrazing should be avoided because it can result in serious erosion and gullying.

This soil is mostly wooded, but it has only fair to poor potential for wood crops. The operation of planting and harvesting equipment is somewhat limited because of slope. Placing logging trails on the contour as much as possible reduces the hazard of trail gullying. Seedlings that can withstand acid conditions and droughtiness are best suited to this soil.

Steep slopes and depth to bedrock are very serious limitations for urban uses of this soil. The steep slopes make construction extremely difficult, and the hazard of erosion is very serious when vegetation is removed from construction sites. Some areas are suitable for certain recreational uses, such as ski slopes. Woodland wildlife habitat can be improved in many areas by planting food-producing shrubs, bushes, and trees.

This Manlius soil is in capability subclass VIe.

MbF—Manlius very shaly silt loam, 35 to 50 percent slopes. This very steep soil is well drained to excessively drained. It formed in glacial till deposits derived from shale bedrock. This soil is on hillsides and sides of valleys on the fringe of the upland plateau where the topography is influenced by the underlying bedrock. Many areas along the valleys are deeply dissected by V-shaped gullies. Slopes are usually smooth and convex. Areas of this soil are elongated and narrow and range from 3 to 100 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of dark grayish brown very shaly silt loam about 4 inches thick. The subsoil, to a depth of 20 inches, is friable, yellowish brown very shaly silt loam. The substratum, to a depth of 25 inches, is brown very shaly silt loam. It is underlain by shale bedrock.

Included with this soil in mapping are small areas of the Blasdell, Aurora, and Schuyler soils. The Blasdell soils are in areas where this soil merges with shaly outwash deposits. The Aurora soils are more loamy and have a lower shale fragment content than this Manlius soil. The Schuyler soils are underlain by bedrock at a depth of more than 40 inches. In many areas, bedrock is within 20 inches of the soil surface, and in a few areas, it outcrops as ledges. Also included are small areas of the less sloping Manlius soils. Areas of included soils range from 1/4 acre to 3 acres.

This Manlius soil usually has a seasonal high water table at a depth of 5 feet or more. Permeability is moderate. The available water capacity is low, and runoff is very rapid. Bedrock is at a depth of 20 to 40 inches. Shale fragments make up 35 to 40 percent of the surface layer. Unless limed, the surface layer and subsoil are extremely acid to strongly acid.

This soil is not suited to farm and urban uses. Most of the acreage is in woodland, and a few areas are idle.

The soil is not suited to cultivated crops or to hay or pasture. Very steep slopes, very serious erosion hazard, moderate depth to bedrock, and droughtiness are the main limitations. Slopes are too steep for the safe operation of farm equipment.

This soil is mostly wooded, but it has only fair to poor potential for wood crops. The operation of planting and harvesting equipment is seriously limited because of slope. Placing logging trails on the contour as much as possible reduces the hazard of trail gullying. Seedlings that can withstand acid conditions and droughtiness are best suited to this soil.

Because of very steep slopes, ledgy rock outcrops, and depth to bedrock, this soil is not suited to urban uses. The very steep slopes make construction extremely difficult, if not impossible. Woodland wildlife habitat can be improved in many areas by planting food-producing shrubs and bushes. Most areas of this soil are best left in native plant cover.

This Manlius soil is in capability subclass VIIe.

McB—Mardin silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in loamy glacial till. The lower part of the subsoil is a dense, compact fragipan. This soil is on broad divides on upland till plains and on the lower side slopes of valleys. Areas of this soil are irregular in shape and range from 5 to 50 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part is 5 inches of friable, yellowish brown silt loam underlain by 3 inches of firm, pale brown silt loam. The lower part is a very firm fragipan. The upper part of the fragipan is mottled, light olive brown channery loam, and the lower part is mottled, olive brown very channery loam. The substratum to a depth of 60 inches or more is very firm, olive brown very channery loam.

Included with this soil in mapping are small areas of the Williamson, Langford, and Volusia soils. The Williamson soils have a deep, gravel-free silt mantle. The Langford soils have an accumulation of clay in the subsoil. The somewhat poorly drained Volusia soils are along drainageways and on foot slopes. Included wet spots and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

This Mardin soil has a perched seasonal high water table above the fragipan in the spring. The dense fragipan at a depth of 16 to 26 inches restricts root development. Small stones range from none to 15 percent in the surface layer and consist mostly of sandstone, siltstone, or shale. Permeability is moderate in the upper part of the subsoil and slow or very slow in the fragipan and substratum. The available water capacity is moderate, and runoff is medium. The surface layer and upper part of the subsoil range from extremely acid to slightly acid, unless limed.

This soil is suitable for farming but has limitations for urban uses. Approximately half the acreage is cultivated or in hay, and the other half is in woods or pasture.

This Mardin soil is moderately suited to cultivated crops. Tillage is slightly delayed in the spring because of wetness. Subsurface drainage of included wet spots allows for earlier cultivation of many fields. This soil can be productive for certain vegetable crops, such as potatoes, but the fragipan restricts development of deep-rooted crops. Since the surface layer is nearly free of stones, potato harvesters usually function well. Erosion is a hazard on long slopes and in intensively cultivated areas. Using cover crops, returning crop residues to the soil, keeping tillage to a minimum, terracing, tilling on the contour, and stripcropping, where topography permits, control erosion. Many of these practices also help maintain good tilth. Because soil structure is difficult to maintain, this soil should not be plowed when wet. If irrigation water is applied, it should be at a moderate to slow rate to prevent soil and water loss.

This soil is well suited to hay and pasture. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction and trampling of pasture plants, which restricts plant growth and can lead to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and restricted grazing during wet periods are desirable management practices.

The potential of this soil for wood crops is fair to good. Although the erosion hazard is usually not a problem, logging roads and skid trails should be on the contour or across the slope wherever possible to prevent trail gullying. Brush removal and planting early in the spring when the soil is moist improve seedling survival.

The main limitations for urban uses of this soil are the seasonal high water table, slow or very slow permeability in the fragipan and substratum, and susceptibility to erosion. Interceptor drains placed upslope from buildings divert runoff and seepage and minimize seasonal wetness. Revegetating construction sites as soon as possible helps eliminate the erosion hazard. Applications of lime help in the quick establishment and maintenance of lawns. Some areas are suitable for ponds.

This Mardin soil is in capability subclass IIw.

McC—Mardin silt loam, 8 to 15 percent slopes. This sloping soil is deep and moderately well drained. It formed in loamy glacial till. The lower part of the subsoil is a dense, compact fragipan. This soil is on hillsides, on rolling till plains, and on the upland plateau. Areas of this soil are oblong or irregular in shape and range from 5 to 40 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part is 5 inches of friable, yellowish brown silt loam underlain by 3 inches of firm, pale brown silt loam. The lower part of the subsoil is a very firm fragipan. The upper part of the fragipan is mottled, light olive brown channery loam, and the lower part is mottled, olive brown very channery loam. The substratum to a depth of 60 inches or more is very firm, olive brown, very channery loam.

Included with this soil in mapping are many small areas of the Williamson, Langford, and Volusia soils. The Williamson soils have a deep, gravel-free silt mantle, the Langford soils have an accumulation of clay in the subsoil, and the somewhat poorly drained Volusia soils are along drainageways and on foot slopes. Included wet spots and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

This Mardin soil has a perched seasonal high water table above the fragipan in the spring. The dense fragipan at a depth of 16 to 26 inches restricts root development. Small stones range from none to 15 percent in the surface layer and are mostly sandstone, siltstone, or shale. Permeability is moderate in the upper part of the subsoil and slow or very slow in the fragipan and substratum. The available water capacity is moderate, and runoff is medium to rapid. Bedrock is at a depth of 5 feet or more. The surface layer and upper part of the subsoil range from extremely acid to slightly acid.

This soil is suitable for farming but has limitations for urban uses. Approximately half the acreage is in hay or pasture, or it is idle, and the other half is in woodland.

This Mardin soil is moderately suited to cultivated crops. Erosion is a serious hazard on long slopes and in intensively cultivated areas. Tillage is slightly delayed in the spring because of wetness. Subsurface drainage of included wet spots allows for earlier cultivation of many fields. This soil can be productive for certain crops, such as potatoes, but the fragipan restricts development of deep-rooted crops. Since the surface layer is nearly free of stones, tillage and harvesting equipment usually function well. Using cover crops, returning crop residues to the soil, keeping tillage to a minimum, terracing, tilling on the contour, and stripcropping, where topography permits, control erosion. Many of these practices also help maintain good tilth. Because soil structure is difficult to maintain, this soil should not be plowed when it is wet.

This soil is suited to hay and pasture. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction and trampling of pasture plants, which restrict plant growth and can lead to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and restricted grazing during wet periods are desirable management practices.

The potential for wood crops on this soil is fair to good. Although erosion is usually not a problem, logging roads and skid trails should be on the contour or across the slope wherever possible to prevent trail gullying. Removing brush and planting early in the spring when the soil is moist improve seedling survival. Large areas are suitable for mechanical planting of seedlings.

The main limitations for urban uses of this soil are the seasonal high water table, slope, slow or very slow permeability in the fragipan and substratum, and susceptibility to erosion. Interceptor drains placed upslope from buildings divert runoff and seepage. Revegetating construction sites as soon as possible helps eliminate the erosion hazard. Applications of lime help in the quick establishment and maintenance of lawns or vegetative cover. The fragipan is somewhat difficult to excavate.

This Mardin soil is in capability subclass IIIe.

MdB—Mardin channery silt loam, 3 to 8 percent slopes. This sloping soil is deep and moderately well drained. It formed in loamy glacial till. The lower part of the subsoil is a dense, compact fragipan. This soil is on broad convex divides, on ridges and knolls, and on undulating areas of upland till plains. Areas of this soil are elongated or irregular in shape and range from 3 to 100 acres.

Typically, this soil has a surface layer of dark grayish brown channery silt loam 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part is 5 inches of friable, yellowish brown channery silt loam underlain by 3 inches of firm, pale brown channery silt loam. The lower part of the subsoil is a very firm fragipan. The upper part of the fragipan is mottled, light olive brown channery loam, and the lower part is mottled, olive brown very channery loam. The substratum to a depth of 60 inches or more is very firm, olive brown very channery loam.

Included with this soil in mapping are small areas of the Langford, Volusia, Schuyler, and Valois soils. The Langford soils have an accumulation of clay in the subsoil. The somewhat poorly drained Volusia soils are along drainageways and on foot slopes. The Schuyler soils do not have a fragipan and are underlain by bedrock at a depth of 40 to 60 inches. The Valois soils are mostly along lower valley sides, and they are friable and do not have a fragipan. Included wet spots and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

This Mardin soil has a perched seasonal high water table above the fragipan in the spring. The dense fragipan at a depth of 16 to 26 inches restricts root development. Small stones range from 15 to 35 percent in the surface layer and are mostly sandstone, siltstone, or shale. Permeability is moderate in the upper part of the subsoil and slow or very slow in the fragipan and substratum. The available water capacity is moderate, and runoff is medium. The surface layer and upper part of the subsoil range from extremely acid to slightly acid.

This soil is suitable for farming but has limitations for urban uses. Most of the acreage is farmed or is in woodland, or it is idle.

This Mardin soil is moderately suited to cultivated crops. Tillage is slightly delayed in the spring because of wetness. Subsurface drainage of included wet spots allows for earlier cultivation of many fields. Channery fragments interfere with tillage and planting of some crops and cause excessive wear of equipment. This soil can be productive for certain crops, such as potatoes, but the fragipan restricts development of deep-rooted crops. Erosion is a hazard on long slopes and in intensively cultivated areas. Using cover crops, returning crop residues to the soil, keeping tillage to a minimum, terracing, and tilling on the contour control erosion and help maintain good tilth. If irrigation water is applied, it should be at a moderate to slow rate to prevent soil and water loss.

This soil is suited to hay and pasture. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction and trampling of pasture plants, which restrict plant growth and can lead to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and restricted grazing during wet periods are desirable management practices. Applications of lime improve the growth of most pasture plants.

The potential of this soil for wood crops is fair to good. Although the erosion hazard is usually not a problem, logging roads and skid trails should be placed across the slope wherever possible to prevent trail gullying. Removing brush and planting early in the spring when the soil is moist improve seedling survival. Machine planting of seedlings is practical in large areas, although small stones are slightly bothersome.

The main limitations for urban uses of this soil are the seasonal high water table, slow or very slow permeability in the fragipan and substratum, and small stones. Interceptor drains placed upslope from buildings divert runoff and seepage and minimize the seasonal wetness. Applications of lime help in the quick establishment and maintenance of lawns. Channery fragments are bothersome when establishing lawns and gardens. Some areas are suitable for ponds.

This Mardin soil is in capability subclass IIw.

MdC—Mardin channery silt loam, 8 to 15 percent slopes. This sloping soil is deep and moderately well drained. It formed in loamy glacial till. The lower part of the subsoil is a dense, compact fragipan. This soil is on sides of valleys, ridges, and hills on till plains in the uplands. Areas of this soil are elongated or irregular in shape and range from 3 to 100 acres or more.

Typically, this soil has a surface layer of dark grayish brown channery silt loam 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part is 5 inches of friable, yellowish brown channery silt loam underlain by 3 inches of firm, pale brown channery silt loam. The lower part is a very firm fragipan. The upper part of the fragipan is mottled, light olive brown channery loam, and the lower part is mottled, olive brown very channery loam. The substratum to a depth of 60 inches or more is very firm, olive brown very channery loam.

Included with this soil in mapping are small areas of the Langford, Volusia, Derb, and Valois soils. The Langford soils have an accumulation of clay in the subsoil. The somewhat poorly drained Volusia soils are along drainageways and on foot slopes. The Derb soils are underlain by bedrock at a depth of 40 to 60 inches. The Valois soils are mostly along lower valley sides, and they are friable and do not have a fragipan. Included wet spots and drainageways are indicated by special symbols on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

This Mardin soil has a perched seasonal high water table above the fragipan in the spring. The dense fragipan at a depth of 16 to 26 inches restricts root development. Small stones range from 15 to 35 percent in the surface layer and are mostly sandstone, siltstone, or shale. Permeability is moderate in the upper part of the subsoil and slow or very slow in the fragipan and substratum. The available water capacity is moderate, and runoff is medium to rapid. The surface layer and upper part of the subsoil range from extremely acid to slightly acid.

This soil is moderately suited to farming but has limitations for urban uses. Most of the acreage is in hay, pasture, or woodland. Some areas are idle.

This Mardin soil is moderately suited to cultivated crops. Erosion is a serious hazard on long slopes and in intensively cultivated areas. Tillage is slightly delayed in the spring because of temporary wetness. Subsurface drainage of included wet spots allows for earlier cultivation of many fields. Channery fragments interfere with planting fine seed crops and harvesting root or tuber crops. This soil can be productive for certain crops, such as potatoes, but the fragipan restricts development of deep-rooted crops. Using cover crops, returning crop residues to the soil, keeping tillage to a minimum, tilling on the contour, and stripcropping, where topography permits, help control erosion. Many of these practices also help maintain good tilth.

This soil is suited to hay and pasture. Grazing when the soil is wet in the spring is the major concern of pasture management. It causes soil compaction and trampling of pasture plants, which restrict plant growth and can lead to the loss of the pasture seedings. Proper stocking, rotation of pastures, yearly mowing, and restricted grazing during wet periods are desirable management practices. Applications of lime help maintain high forage production.

The potential of this soil for wood crops is fair to good. Although the erosion hazard is usually not a problem, logging roads and skid trails should be on the contour or across the slope wherever possible to prevent trail gullying. Removing brush and planting early in the spring when the soil is moist improve seedling survival.

The main limitations for urban uses of this soil are the seasonal high water table, slope, slow or very slow permeability in the fragipan and substratum, and small stones. Interceptor drains placed upslope from buildings divert runoff and seepage and minimize seasonal wetness. Revegetating construction sites as soon as possible helps eliminate the hazard of erosion. Applications of lime usually help in the quick establishment and maintenance of lawns. Channery fragments are bothersome when establishing lawns, golf fairways, and gardens.

This Mardin soil is in capability subclass IIIe.

MdD—Mardin channery silt loam, 15 to 25 percent slopes. This moderately steep soil is deep and moderately well drained. It formed in loamy glacial till. The lower part of the subsoil is a dense, compact fragipan. This soil is on hillsides and on the sides of ridges and valleys on the upland plateau. Areas of this soil are mostly oblong and range from 5 to 40 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part is 5 inches of friable, yellowish brown silt loam underlain by 3 inches of firm, pale brown silt loam. The lower part is a very firm fragipan. The upper part of the fragipan is mottled, light olive brown channery loam, and the lower part is mottled, olive brown very channery loam. The substratum to a depth of 60 inches or more is very firm, olive brown very channery loam.

Included with this soil in mapping are small areas of the Langford and Valois soils. The Langford soils have an accumulation of clay in the subsoil. The Valois soils are along lower valley sides, and they are friable and do not have a fragipan. Also included is a soil on convex shoulder slopes that is similar to this Mardin soil but better drained; a few areas where the surface layer is stone-free silt loam; and a soil that is underlain by bedrock within 40 inches of the surface. Included drainways are indicated on the soil map by a special symbol. Areas of included soils range from 1/4 acre to 3 acres.

This Mardin soil has a perched seasonal high water table above the fragipan in the spring. The dense fragipan at a depth of 16 to 26 inches restricts root development. Small stones range from 15 to 35 percent in the surface layer and are mostly sandstone, siltstone, or shale. Permeability is moderate in the upper part of the subsoil and slow or very slow in the fragipan and substratum. The available water capacity is moderate, and runoff is rapid. The surface layer and upper part of the subsoil are extremely acid to slightly acid.

This soil has limitations for both farm and urban uses. Most of the acreage is in woodland. A few areas are in pasture.

This Mardin soil is poorly suited to cultivated crops because of the very serious erosion hazard. The moderately steep slopes limit the use of farm equipment. Tillage is slightly delayed in the spring because of wetness. Channery fragments interfere with tillage and cause excessive wear of machinery. The fragipan restricts development of deep-rooted crops. If cultivated crops are grown, it should be infrequently, and a maximum of conservation management practices should be used. Using cover crops, returning crop residues to the soil, keeping tillage to a minimum, including sod crops in the cropping system, tilling on the contour, and stripcropping, where topography permits, help to control erosion and maintain good tilth.

This soil is often better suited to hay and pasture than to cultivated crops. Grazing when the soil is wet and overgrazing are the major concerns of pasture management. Grazing when the soil is wet causes soil compaction and trampling of pasture plants, which restrict growth and may lead to the loss of the pasture seeding. Overgrazing increases the hazard of erosion. Proper stocking, rotation of pastures, yearly mowing, liming, and restricting grazing during wet periods are desirable management practices.

The potential of this soil for wood crops is fair to good. Although the erosion hazard is usually not a problem, logging roads and skid trails should be on the contour or across the slope wherever possible to prevent trail gullying. The use of farm equipment is restricted by the moderately steep slopes.

The main limitation for urban uses of this soil is the moderately steep slope. Other limitations are the seasonal high water table, slow or very slow permeability in the fragipan and substratum, and small stones. Revegetating construction sites as soon as possible helps control erosion. Applications of lime help to quickly establish and maintain lawns.

This Mardin soil is in capability subclass IVe.

MeF—Mardin-Valois complex, 25 to 50 percent slopes. This steep complex consists of deep, moderately well drained Mardin soils and deep, well drained Valois soils. They formed in glacial till. This complex is on sides of valleys and deeply dissected gullies along lower valley walls. The Mardin soils have a dense fragipan in the lower part of the subsoil. These soils have a surface layer of channery silt loam, gravelly silt loam, or channery loam. Areas of these soils are oblong and range from 5 to 30 acres or more.

This complex is about 50 percent Mardin soils, 30 percent Valois soils, and 20 percent other soils. These soils form such an intricate pattern that it was not feasible to map them separately.

Typically, the Mardin soil has a surface layer of dark grayish brown channery silt loam 8 inches thick. The subsoil extends to a depth of 50 inches. It is yellowish brown channery silt loam in the upper part; mottled, pale brown channery silt loam in the middle part; and a fragipan of mottled, olive brown channery loam in the lower part. The substratum to a depth of 60 inches is mottled, olive brown very channery loam.

Typically, the Valois soil has a surface layer of dark grayish brown gravelly silt loam 8 inches thick. The subsoil extends to a depth of 52 inches. It is yellowish brown gravelly silt loam in the upper part, yellowish brown gravelly loam in the middle part, and brown gravelly sandy loam in the lower part. The substratum to a depth of 65 inches is very friable, grayish brown very gravelly sandy loam.

Included with this complex in mapping are areas of Derb soils, Manlius soils, and Fluvaquents and Udifluvents. The Derb soils are somewhat poorly drained and are underlain by bedrock 40 to 60 inches below the surface. The Manlius soils are underlain by shale bedrock within 40 inches of the surface. Narrow strips of Fluvaquents and Udifluvents, frequently flooded, are on deeply dissected stream bottoms. Intermittent drains are indicated on the soil map by a special symbol. Areas of included soils range from 1/4 acre to 3 acres.

The Mardin soil has a perched seasonal high water table above the fragipan in the spring. The dense fragipan at a depth of 14 to 26 inches restricts root development. In the Mardin soils, permeability is moderate in the subsoil above the fragipan and is very slow or slow in the fragipan and substratum. In the Valois soils, permeability is moderate in the subsoil and moderate or moderately rapid in the substratum. The available water capacity is moderate, and runoff is rapid or very rapid for this complex. Channery or gravelly fragments make up 15 to 35 percent of the surface layer of these soils. Bedrock is at a depth of 5 feet or more. In both soils, reaction ranges from very strongly acid to medium acid in the surface layer and upper part of the subsoil, unless limed.

Because of the steep slopes this complex is poorly suited to farming and urban uses. Almost all the acreage is in woodland.

These steep soils are not suited to cultivated crops or hay crops. They can be used for permanent pasture, but reseeding and applying fertilizers is very difficult because of slope. The operation of standard farm equipment is hazardous.

Overgrazing is the major concern of pasture management because it reduces plant growth, may cause the loss of the pasture seeding, and can result in serious erosion. Proper stocking, rotation of pastures, and deferment of grazing are the chief management needs.

The potential of this complex for wood crops is fair to good. Erosion is a hazard; therefore, logging roads and skid trails should be placed on the contour or across the slope wherever possible to reduce trail gullying. The use of equipment is seriously limited because of the steep slopes. Planting of seedlings usually is done by hand.

The steep slope is a very serious limitation for most urban uses of this complex. The seasonal high water table and slowly or very slowly permeable fragipan of the Mardin soils are also limitations. Removal of vegetation should be held to a minimum, and temporary plant cover needs to be established quickly in denuded areas. Some areas are suited to specialized recreational uses, such as ski slopes, or to the development of woodland wildlife habitat.

This Mardin-Valois complex is in capability subclass VIIe.

MfA—Marilla shaly silt loam, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It is on flat, shelflike areas near the northern fringe of the upland plateau. This soil has a dense, compact fragipan in the lower part of the subsoil. Areas of this soil are irregular in shape and range from 3 to 20 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 8 inches thick. The subsoil is about 34 inches thick. It is friable, mottled, yellowish brown shaly silt loam in the upper part and firm, olive brown shaly silt loam in the lower part. The substratum to a depth of 60 inches or more is olive gray to dark olive gray very shaly silt loam.

Included with this soil in mapping are small intermingled areas of the Mardin, Derb, Manlius, and Farnham soils. The Mardin soils have a low content of shale fragments and a high content of sandstone fragments. The Derb soils are wetter than this Marilla soil. The Manlius soils are underlain by shale bedrock at a depth of 20 to 40 inches. The substratum of the Farnham soils is dominantly loose shaly and gravelly material. Areas of included soils range from 1/2 acre to 3 acres.

This Marilla soil has a perched seasonal high water table above the dense fragipan in the spring. Permeability is very slow in the fragipan but moderate in the layers above the pan. The available water capacity is low to moderate, and runoff is slow to medium. Depth to bedrock is generally 5 feet or more. Shale fragments make up 20 to 35 percent of the surface layer. The surface layer and upper part of the subsoil are strongly acid or very strongly acid, unless limed.

This soil is moderately suited to farming but poorly suited to most urban uses. Most of the acreage is used for farming, but some sizable areas are idle. A few areas of this soil are urbanized.

This Marilla soil is moderately suited to cultivated crops. Temporary seasonal wetness early in the spring can delay tilling and planting of some crops. The high content of shale fragments in the surface layer causes problems in cultivating some crops and can cause excessive wear of machinery. Drainage of the wetter soils is needed for more efficient management of fields. Keeping tillage to a minimum, using cover crops, returning crop residues to the soil, plowing at the proper soil moisture level, and including sod crops in the cropping system improve tilth and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. The dense fragipan restricts development of deep-rooted crops.

This soil is suited to pasture and hay. Additions of lime and fertilizer greatly improve the quality of most permanent pasture. Grazing should be restricted during wet and rainy periods to prevent soil compaction and trampling of pasture grasses.

The potential of this soil for wood crops is fair to good, but only a small acreage is wooded. Machine planting is practical on large areas of this soil. Seedling mortality and uprooting of trees during windstorms are usually not hazards.

The seasonal high water table and very slow permeability in the fragipan and substratum are limitations for many urban uses of this soil. Drains around foundations help keep basements dry. Liberal applications of lime and fertilizer are needed to maintain high quality lawns. This soil tends to be droughty during the drier summer months, and irrigation may be needed when lawns are being established.

This Marilla soil is in capability subclass IIw.

MfB—Marilla shaly silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It is on the sides of shelflike areas near the northern fringe of the upland plateau and in a few lowland areas. This soil has a dense, compact fragipan in the lower part of the subsoil. Areas of this soil are irregular in shape and range from 3 to 100 acres, but areas of 5 to 40 acres are most common.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 8 inches thick. The subsoil is about 34 inches thick. It is friable, mottled, yellowish brown shaly silt loam in the upper part and a fragipan of firm, olive brown shaly silt loam in the lower part. The substratum to a depth of 60 inches or more is olive gray to dark olive gray very shaly silt loam.

Included with this soil in mapping are small intermingled areas of the Mardin, Derb, Manlius, and Farnham soils. The Mardin soils have a low content of shale fragments and a high content of sandstone fragments. The Derb soils are in wet, low areas. The Manlius soils are underlain by shale bedrock at a depth of 20 to 40 inches. The substratum of the Farnham soils is dominantly loose shaly and gravelly material. Areas of included soils range from 1/2 acre to 3 acres.

This Marilla soil has a perched seasonal high water table above the dense fragipan layer in the spring. Permeability is very slow in the fragipan but moderate in the soil layers above the pan. The available water capacity is low to moderate, and runoff is slow to medium. Depth to bedrock is generally 5 feet or more. Shale fragments make up 20 to 35 percent of the surface layer. The surface layer and upper part of the subsoil are strongly acid or very strongly acid, unless limed.

This soil is moderately suited to farming but has some limitations for urban uses. Most of the acreage is idle, but some areas are farmed. A few areas of this soil are urbanized.

This Marilla soil is moderately suited to cultivated crops. Temporary seasonal wetness early in the spring can delay tilling and planting of some crops. Erosion is a hazard in intensively cultivated areas. The high content of shale fragments in the surface layer causes problems in cultivating some crops and results in more rapid wear of machinery. Drainage of the wetter soils is needed for more efficient management of fields. Keeping tillage to a minimum, using cover crops, returning crop residues to the soil, tilling across slopes, plowing at the proper moisture level, and including sod crops in the cropping system improve tilth, minimize the erosion hazard, and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. The dense fragipan restricts development of deep-rooted crops.

This soil is suited to pasture and hay. Additions of lime and fertilizer improve the quality of most permanent pasture. Grazing should be restricted during wet and rainy periods to prevent soil compaction and trampling of pasture grasses.

The potential of this soil for wood crops is fair to good, but only a small acreage is wooded. Machine planting is practical in large areas of this soil. Seedling mortality and uprooting of trees during windstorms are usually not hazards.

The seasonal high water table and very slow permeability in the fragipan and substratum are limitations for some urban uses of this soil. Interceptor drains placed upslope from buildings divert seepage and minimize wetness. Liberal applications of lime and fertilizer are needed to maintain high quality lawns. This soil tends to be droughty during the drier summer months, and irrigation may be needed when lawns are being established.

This Marilla soil is in capability subclass IIw.

MfC—Marilla shaly silt loam, 8 to 15 percent slopes. This sloping soil is deep and moderately well drained. It is on sides of shelflike areas near the northern fringe of the upland plateau and in a few areas on the lowland plain. This soil has a dense, compact fragipan in the lower part of the subsoil. Areas of this soil are irregular in shape and range from 3 to 60 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of dark grayish brown shaly silt loam about 8 inches thick. The subsoil is about 34 inches thick. It is friable, mottled, yellowish brown shaly silt loam in the upper part and a fragipan of firm, olive brown shaly silt loam in the lower part. The substratum to a depth of 60 inches or more is olive gray to dark olive gray very shaly silt loam.

Included with this soil in mapping are small intermingled areas of the Mardin, Derb, and Manlius soils. The Mardin soils have a low content of shale fragments and a high content of sandstone fragments. The Derb soils are somewhat poorly drained and are on foot slopes. The Manlius soils are underlain by shale bedrock at a depth of 20 to 40 inches. Areas of included soils range from 1/2 acre to 3 acres.

This Marilla soil has a perched seasonal high water table above the dense fragipan in the spring. Permeability is very slow in the fragipan but moderate in the layers above the pan. The available water capacity is low to moderate, and runoff is rapid. Depth to bedrock is generally 5 feet or more. Shale fragments make up 20 to 35 percent of the surface layer. The surface layer and upper part of the subsoil are strongly acid or very strongly acid, unless limed.

This soil is somewhat limited for farming and urban uses. Most of the acreage is in woodland, or it is idle. A few areas are in pasture or hay.

This Marilla soil is limited for cultivated crops because of slope, temporary seasonal wetness, natural low fertility, high content of shale fragments in the surface layer, midsummer droughtiness, and the serious hazard of erosion. In cultivated areas, keeping till to a minimum, using cover crops, tilling across slopes, returning crop residues to the soil, stripcropping, plowing at the proper moisture level, and including sod crops in the cropping system improve tilth, control erosion, and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. The dense fragipan restricts development of deep-rooted crops.

This soil is suited to pasture and hay. Additions of lime and fertilizer greatly improve the quality of most permanent pasture. Grazing should be restricted during wet and rainy periods to prevent soil compaction and trampling of pasture grasses.

The potential of this soil for wood crops is fair to good, but only a small acreage is wooded. Machine planting of seedlings is usually practical in large areas of this soil. Seedling mortality and uprooting of trees during windstorms are usually not hazards. Although erosion is usually not hazard, skid trails should be placed across the slope to reduce trail gullying.

The seasonal high water table, very slow permeability in the fragipan and substratum, and slope are serious limitations for many urban uses of this soil. Interceptor drains divert runoff and seepage around buildings and dwellings. Because erosion is a hazard where the soil is disturbed during construction, disturbed areas need to be revegetated as soon as possible. Liberally applying lime and fertilizer and watering during dry periods help establish and maintain high quality lawns.

This Marilla soil is in capability subclass IIIe.

Mg—Middlebury silt loam. This nearly level soil is deep and moderately well drained to somewhat poorly drained. It formed in alluvial deposits on flood plains. Slope ranges from 0 to 3 percent but is mostly less than 2 percent. Areas of this soil are elongated or irregular in shape and are generally parallel to the adjacent stream. Most areas range from 5 to 30 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 37 inches. It is dark brown silt loam in the upper part; mottled, dark brown silt loam in the middle part; and mottled, dark brown very fine sandy loam in the lower part. The substratum to a depth of 60 inches or more is dark brown stratified sand and silt in the upper part and dark brown stratified fine sand and gravel in the lower part.

Included with this soil in mapping are small intermingled areas of the Tioga and Teel soils. The Tioga soils are on slightly elevated, convex parts of the flood plain. The Teel soils are high in silt and low in sand content. Also included in mapping are small areas of a soil in slight depressions that is similar to this Middlebury soil but more poorly drained. Areas of included soils range up to 3 acres.

This Middlebury soil floods during most years early in the spring and in heavy rainy periods. A seasonal high water table rises into the subsoil from February through April and is controlled by adjacent streams. Permeability is moderate in the subsoil. The available water capacity is high, and runoff is slow. In unlimed areas, the surface layer ranges from strongly acid to slightly acid and the subsoil and substratum are medium acid to neutral. Depth to bedrock is generally 5 feet or more.

The soil is suitable for farming but poorly suited to urban uses because of the flood hazard. Most of the acreage is farmed or in woodland.

This Middlebury soil is suited to cultivated crops (fig. 6). Flooding can delay planting or cause crop damage in some years, but is usually not a problem. The seasonal high water table also can delay tillage and planting, especially in low lying areas. Wetness can be minimized by installing subsurface drains, if adequate outlets are available. Keeping tillage to a minimum, using cover crops, returning crop residues to the soil, plowing at the proper moisture level, and including sod crops in the cropping system improve tilth and maintain the organic matter content, which lead to increased crop production. Streambanks need protection in some areas to prevent lateral erosion of the fields.

This soil is well suited to pasture and hay. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is good. The hazard of erosion, restricted use of equipment, and seedling mortality are only slight problems. Uprooting of trees during windstorms is generally not a problem.

Flooding, seasonal wetness, and high risk of frost damage are serious limitations for most urban uses of this soil. The hazard of flooding is also a problem for many recreational uses.

This Middlebury soil is in capability subclass IIw.

Mh—Minoa very fine sandy loam. This nearly level soil is deep and somewhat poorly drained. It is in broad, flat areas that were deltas or beaches of glacial lakes. These areas are elongated or irregular in shape and range from 3 to 100 acres, but most of these areas are less than 50 acres. In the southern part of the county, this soil is in small, low areas or along drainageways that contain sandy outwash deposits. These areas are elongated and mostly range from 3 to 40 acres. Slope ranges from 0 to 3 percent.

Typically, this soil has a surface layer of very dark grayish brown very fine sandy loam about 9 inches thick. The subsoil extends to a depth of 40 inches. It is mottled, light yellowish brown very fine sandy loam in the upper part; mottled, pale brown loamy very fine sand in the middle part; and mottled, grayish brown loamy very fine sand in the lower part. The substratum to a depth of 55 inches is light brownish gray loamy very fine sand.

Included with this soil in mapping are small areas of the Cosad, Galen, Elnora, Raynham, Niagara, and Lamson soils. The Cosad soils formed in sandy deposits underlain by clayey lacustrine material. The moderately well drained Galen and Elnora soils are on small higher knolls than this Minoa soil. The Raynham and Niagara soils formed in dominantly silty deposits. The poorly drained to very poorly drained Lamson soils are in drainageways or in small depressions. Also included are small areas of the gently sloping Minoa soil; soils that have strata several inches thick of silt, clay, or densely compacted sand in the subsoil; and in the northern part of the county, large areas of a soil that is similar to this Minoa soil but has varved silt loam and silty clay in the substratum. Areas of included soils range from 1/2 acre to 3 acres.

Figure 6.—The Middlebury silt loam soils in the foreground are suited to field crops. The hummocky surface of the Varysburg soils in the background is caused by downslope slippage. These soils are better suited to pasture or hay than to cultivated crops.

From February through April this Minoa soil has a seasonal high water table in the upper part of the subsoil. Permeability is moderate in the surface layer and subsoil and moderate or moderately rapid in the substratum. The available water capacity is moderate, and internal drainage and runoff are slow. Depth to bedrock is generally 5 feet or more. Unless limed, the surface layer and upper part of the subsoil are strongly acid to neutral.

Seasonal wetness, low soil strength, and instability of the soil when excavated limit many uses of this soil. Current land use is varied and includes residential development, farming, woodland, and idle areas. This soil is best suited to buildings without basements, to play and picnic areas, or, where artifically drained, to crops.

This Minoa soil is suited to cultivated crops if properly drained. Most areas respond well to subsurface drainage if adequate outlets are available. Erosion is not a problem on this nearly level soil, except where ditchbanks are unprotected. Keeping tillage to a minimum, using cover crops, and including sod crops in the cropping system improve tilth, help maintain the organic matter content, and improve crop production. This gravel- and stone-free soil is easy to till at the proper moisture level.

Without drainage, this soil is best suited to hay or pasture. Overgrazing and grazing when this soil is wet are major concerns of pasture management. Overgrazing can cause the loss of the seeding, and grazing when the soil is wet can lead to compaction of the soil and trampling of pasture plants. Proper stocking, rotation of grazing, yearly mowing, and restricted grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is fair. Erosion is not a hazard, but seasonal wetness increases seedling mortality and restricts the use of equipment. Trees that can tolerate a seasonal wetness are best suited to this soil.

The seasonal high water table, low soil strength, and the tendency of cut banks to cave are serious limitations for most urban uses of this soil. Drains around foundations reduce seasonal wetness.

This Minoa soil is in capability subclass IIIw.

Ne—Newstead loam. This nearly level soil is moderately deep and somewhat poorly drained. It formed in glacial till deposits derived mainly from limestone. This soil is in low, flat areas at the northern edge of the upland plateau, just south of the limestone escarpment. Slope is 0 to 3 percent. Areas of this soil are irregular in shape and range from 5 to 100 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of black loam about 10 inches thick. The subsurface layer is mottled, pale brown fine sandy loam about 3 inches thick. The subsoil, which extends to a depth of 21 inches, is mottled, dark brown loam. The substratum is mottled, reddish brown gravelly loam about 6 inches thick. Hard, gray limestone bedrock is at a depth of 27 inches.

Included with this soil in mapping are small intermingled areas of the Wassaic, Appleton, and Kendaia soils. The Wassaic soils are better drained than this Newstead soil and are on slightly elevated parts of the landscape. The somewhat poorly drained Appleton and Kendaia soils are underlain by bedrock at a depth of 5 feet or more. Also included are some areas where bedrock is less than 20 inches below the soil surface and a few areas where the soil is poorly drained. Areas of included soils range from 1/2 acre to 3 acres.

From December through May this Newstead soil has a perched seasonal high water table that rises into the upper part of the subsoil. Permeability is moderate throughout the soil. Runoff is slow. Gravel makes up 2 to 15 percent of the surface layer. Bedrock is at a depth of 20 to 40 inches. Reaction ranges from medium acid to mildly alkaline in the surface layer.

Because of seasonal wetness and depth to bedrock, this soil is poorly suited to most farm and urban uses. Most of the acreage is in woodland, or it is idle. Some areas of this soil are farmed, and a few areas are used for urban purposes.

This Newstead soil is poorly suited to cultivated crops, unless drained. Subsurface drainage is difficult to install because bedrock is at a moderate depth and the soil should be deeper to insure adequate installation. Where open drains can be installed, this soil is suited to many crops grown in the county. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at proper soil moisture level, and rotating crops improve tilth and help maintain the organic matter content. Because of seasonal wetness, this soil is poorly suited to pasture and hay. Surface drainage or land shaping is desirable for optimum production of forage crops.

Grazing when the soil is wet is the major concern of pasture management on this soil. Grazing during wet periods causes soil compaction and trampling of pasture plants, which reduce forage growth. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the main management needs.

The potential of this soil for wood crops is poor because of seasonal wetness and moderate depth to bedrock, but many areas are wooded. Erosion is not a hazard, but limited use of equipment and seedling mortality are serious problems. Because of the restricted rooting depth, trees may uproot during windstorms.

The seasonally high water table and depth to bedrock are serious limitations for most urban uses of this soil. Where the soil is used for septic tank absorption fields, ground water may be contaminated because the fissured limestone bedrock is close to the soil surface. The bedrock is very hard and difficult to excavate; blasting is often required. Some areas have good potential for the development of wildlife habitat.

This Newstead soil is in capability subclass IIIw.

NfA—Niagara silt loam, 0 to 3 percent slopes. This nearly level, silty soil is deep and somewhat poorly drained. It is on broad, moderately low flats in the northern part of the county and in a few flat areas elsewhere. Areas of this soil are irregular in shape and range from 5 to 200 acres or more.

Typically, this soil has a surface layer of dark brown silt loam about 11 inches thick. The subsoil extends to a depth of 27 inches. The upper 5 inches is mottled, yellowish brown silt loam, and it is underlain by mottled, dark brown light silty clay loam grading to silt loam. The substratum is dark brown silt loam to a depth of 60 inches and olive brown coarse silt and very fine sand below 60 inches.

Included with this soil in mapping are small areas of the Niagara soils that have gravelly or stony deposits between depths of 40 and 60 inches. Also included are areas of the Cosad, Raynham, Collamer, and Canandaigua soils. The Cosad soils have a sandy surface mantle, the Raynham soils have a lower clay content than the Niagara soils, the Collamer soils are on slightly convex knolls and ridges, and the Canandaigua soils are in low depressions. In some areas, the surface layer is very fine sand or silty clay loam. Areas of included soils are 1/2 acre to 3 acres.

From December through May this Niagara soil has a seasonal high water table that rises into the upper part of the subsoil. Permeability is moderately slow in the subsoil and substratum. The available water capacity is high, and runoff and internal drainage are slow. Depth to bedrock is generally 5 feet or more. There are usually no gravel and stones in the soil. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

Seasonal wetness, moderately slow permeability, and low soil strength limit many uses of this soil. This soil is used for various purposes, including residential and commercial development, farming, and woodland. Many areas of this soil are idle.

This Niagara soil is not well suited to farming, unless drained. Erosion is not a problem on this nearly level soil, but it may puddle and compact if tilled when wet. In some areas drainage is difficult to install because of the nearly level slopes, instability of cut banks, and lack of suitable outlets. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for most crops grown in the county except early-market and long-season varieties. Keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system help maintain good tilth.

Without adequate drainage, this soil is best suited to hay and pasture plants that can withstand seasonal wetness. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricts growth, and can lead to the loss of the pasture grasses. Restricting grazing in wet periods, rotational grazing, and yearly mowing are desirable management practices.

The potential of this soil for wood crops is fair. The erosion hazard is slight, but seasonal wetness limits the use of planting and harvesting equipment and increases seedling mortality. Trees rooted in this soil are generally able to withstand excessive wind velocities. Trees that can withstand seasonal wetness are best suited to this soil.

The seasonal high water table, low soil strength, poor soil compaction, and moderately slow permeability are serious limitations for most urban uses of this Niagara soil. If storm sewers or other outlets are available, drains can be installed around foundations to minimize the seasonal wetness. Sidewalls of excavations tend to slump or cave, especially when the soil is saturated. Because this soil has a high silt content, frost may damage roads and dwellings without basements.

This Niagara soil is in capability subclass IIIw.

NfB—Niagara silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in silty lake-laid deposits. This soil is in moderately low, undulating areas in the northern part of the county and in a few areas elsewhere. Areas of this soil are irregular in shape and range from 3 to 40 acres.

Typically, this soil has a surface layer of dark brown silt loam about 11 inches thick. The subsoil extends to a depth of 27 inches. The upper 5 inches is mottled, yellowish brown silt loam, and it is underlain by mottled, dark brown light silty clay loam grading to silt loam. The substratum is dark brown silt loam to a depth of 60 inches and olive brown coarse silt and very fine sand below 60 inches.

Included with this soil in mapping are small areas of Niagara soils that have gravelly or stony deposits at a depth of 40 to 60 inches and Niagara soils that are nearly level. Also included are areas of the Collamer, Canandaigua, and Rhinebeck soils. The Collamer soils are on slightly convex knolls and ridges, the Canandaigua soils are in low depressions, and the Rhinebeck soils are dominantly clayey. In some areas, the surface layer is very fine sand or silty clay loam; and in a few areas, the subsoil has strata of gravel. Areas of included soils range from 1/2 acre to 3 acres.

From December through May this Niagara soil has a seasonal high water table that rises into the upper part of the subsoil. Permeability is moderately slow in the subsoil and substratum. The available water capacity is high, and runoff is medium. Depth to bedrock is generally 5 feet or more. There are usually no gravel and stones in the soil. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

Seasonal wetness, moderately slow permeability, and low soil strength limit many uses of this soil. Most of the acreage is farmed, is in woodland, or is idle. A few areas are urbanized.

This Niagara soil is not well suited to farming, unless drained. Erosion is a hazard in intensively cultivated areas and on long slopes. Puddling and compaction are problems if the soil is tilled when wet. Interceptor drains, which divert runoff and seepage from higher adjacent soils, usually need to be closely spaced because the subsoil is moderately slowly permeable. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for many crops grown in the county except early-market and long-season varieties. Keeping tillage to a minimum, using cover crops, tilling across slopes, including grasses and legumes in the cropping system, and plowing at the proper soil moisture level help maintain good tilth and control erosion.

Without adequate drainage, this soil is best suited to hay and pasture plants that can withstand wetness. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricts plant growth, and can lead to the loss of the pasture grasses. The loss of the pasture seeding can cause serious erosion.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of planting and harvesting equipment and increases seedling mortality. Trees rooted in this soil are generally able to withstand all but excessive windstorms. Placing logging trails on the contour reduces the hazard of trail gullying.

The seasonal high water table, low soil strength, poor soil compaction, and moderately slow permeability, are serious limitations for most urban uses of this Niagara soil. If storm sewers or other outlets are available, drains around foundations and interceptor drains that divert runoff from higher adjacent soils minimize seasonal wetness. Sidewalls of excavations tend to slump or cave, especially when the soil is saturated. Because this soil has a high silt content, frost may damage roads and dwellings without basements. This silty soil is also subject to serious erosion when vegetative cover is removed during construction.

This Niagara soil is in capability subclass IIIw.

Ng—Niagara silt loam, fan. This nearly level, silty soil is deep and somewhat poorly drained. It is on the edge of valley floors, mostly in the southern part of the county.

It is in fan-shaped areas where streams from uplands high in silt and clay flow into the valleys. Most areas of this soil are 5 to 30 acres. Slope ranges from 0 to 3 percent.

Typically, this soil has a surface layer of dark brown silt loam about 10 inches thick. The subsurface layer is mottled, dark grayish brown silt loam about 5 inches thick. The subsoil extends to a depth of about 40 inches. The upper 5 inches is mottled, yellowish brown silt loam, and it is underlain by mottled, dark brown light silty clay loam grading to silt loam. The substratum to a depth of 60 inches or more is dark brown silt loam stratified with thin layers of silty clay loam and very fine sand.

Included with this soil in mapping are small areas of the Wayland, Teel, Allard, Scio, and Raynham soils. The Wayland soils are in low areas at the fringe of this map unit; the Teel soils are in higher fringe areas and are subject to more frequent flooding than this Niagara soil; the Allard soils are on benches and knolls that are underlain by gravel; the moderately well drained Scio soils and the somewhat poorly drained Raynham soil have a lower clay content than this Niagara soil. Also included are some areas of gently sloping Niagara soils. Areas of included soils range from 1/2 acre to 2 acres.

From December through May this Niagara soil has a seasonal high water table that rises into the upper part of the subsoil. Flooding from the stream that traverses this map unit is a rare occurrence early in the spring and during other periods of heavy runoff. Permeability is moderately slow in the subsoil and substratum. The available water capacity is high, and runoff and internal drainage are slow. Depth to bedrock is generally 5 feet or more. There are usually no gravel and stones in the surface layer. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

The rare flooding, seasonal wetness, moderately slow permeability, and low soil strength limit most uses of this soil. Most of the acreage is farmed or in woodland, or it is idle. A few areas are used for houses.

This Niagara soil is not well suited to farming, unless drained. Erosion is usually not a problem on this nearly level soil, but infrequent flooding can cause surface scour. Puddling and soil compaction are hazards if the soil is tilled when wet. Drainage can be difficult to install in some areas because of the instability of cut banks and lack of suitable outlets. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for many crops grown in the county except early-market and long-season varieties. Keeping tillage to a minimum, using cover crops, plowing at the proper soil moisture level, and including grasses and legumes in the cropping system help maintain good tilth and minimize the scouring of floodwaters.

Without adequate drainage, this soil is best suited to hay and pasture plants that can withstand seasonal wetness. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricts plant growth, and can lead to the loss of the pasture grasses.

The potential of this soil for wood crops is fair. The erosion hazard is slight, but seasonal wetness limits the use of planting and harvesting equipment and increases seedling mortality. Root development is generally adequate for tree stability. Trees that can withstand seasonal wetness are best suited to this soil.

The rare flooding, seasonal high water table, low soil strength, poor soil compaction, and moderately slow permeability are serious limitations for most urban uses of this soil. If storm sewers or other outlets are available, drains can be installed around foundations to minimize the seasonal wetness. Unless foundations are properly designed, buildings tend to settle unevenly because of the low strength of this soil. Sidewalls of excavations tend to slump or cave, especially when the soil is saturated. Because this soil has a high silt content, frost may damage roads and dwellings without basements.

This Niagara soil is in capability subclass IIIw.

Nh—Niagara silt loam, till substratum. This nearly level soil is deep and somewhat poorly drained. It is on broad flats in the northern part of the county and in smaller areas elsewhere. This gravel-free soil is underlain by shaly or gravelly glacial till deposits at a depth of 40 to 60 inches. Areas of this soil are irregular in shape and range from 3 to 100 acres or more. Slope ranges from 0 to 3 percent.

Typically, this soil has a surface layer of dark brown silt loam about 12 inches thick. The subsurface layer is mottled, grayish brown very fine sandy loam about 2 inches thick. The subsoil extends to a depth of about 26 inches. The upper 3 inches is mottled, yellowish brown silt loam; and the lower part is mottled, dark brown light silty clay loam grading to silt loam. The substratum is dark brown silt loam to a depth of 26 to 40 inches and is olive brown shaly silty clay loam below 40 inches.

Included with this soil in mapping are small areas of the Niagara soils that have gravelly or loamy deposits more than 60 inches below the surface. In a few areas, glacial till deposits are within 40 inches of the surface. Also included are areas of the Collamer and Canandaigua soils. The moderately well drained Collamer soils are on slightly convex knolls and ridges, and the Canandaigua soils are in low depressions. In some areas, bands of gravel are in the subsoil. In a few areas bedrock is within 4 feet of the surface. Areas of included soils range from 1/2 acre to 3 acres.

From December through May this Niagara soil has a seasonal high water table that rises into the upper part of the subsoil. Permeability is moderately slow in the subsoil and slow in the gravelly or shaly substratum. The available water capacity is high, and runoff and internal drainage are slow. Depth to bedrock is generally 5 feet or more. There are usually no gravel and stones in the surface layer. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

Seasonal wetness, slow permeability in the substratum, and instability of cut banks limit many uses of this soil. This soil is used for various purposes, including residential and commercial development, farming, and woodland. Many areas are idle.

This Niagara soil is not well suited to farming, unless drained. Erosion is not a problem on this nearly level soil, but it tends to puddle and compact if tilled when wet. In some areas drainage is difficult to install because of the nearly level slopes, instability of cut banks, and lack of suitable outlets. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for most crops grown in the county except early-market and long-season varieties. Keeping tillage to a minimum, using cover crops, including grasses and legumes in the cropping system, and plowing at the proper soil moisture level help maintain good tilth.

Without adequate drainage, this soil is best suited to hay and pasture plants that can withstand seasonal wetness. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricts plant growth, and can lead to the loss of the pasture grasses. Restricting grazing in wet periods, rotational grazing, and yearly mowing are desirable practices.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of planting and harvesting equipment and increases seedling mortality. Trees rooted in this soil are generally able to withstand all but excessive windstorms. Trees that can withstand seasonal wetness are best suited to this soil.

The seasonal high water table, poor soil compaction, and slow permeability in the loamy substratum are serious limitations for most urban uses of this Niagara soil. If storm sewers or other outlets are available, drains can be installed around foundations to minimize the seasonal wetness. This soil has much greater stability and strength than the other Niagara soils because the substratum is loamy glacial till. Because this soil has a high silt content, frost may damage roads and dwellings without basements.

This Niagara soil is in capability subclass IIIw.

Od—Odessa silt loam. This nearly level soil is deep and somewhat poorly drained. This soil is high in clay content and is on broad, flat plains in the northern part of the county. These plains were formerly the bottoms of glacial lakes. This soil generally is on interfluves between streams and intermittent drainageways. Slope is 0 to 3 percent. Areas of this soil are large and irregular in shape and roughly parallel the streams. Areas range from 5 to 200 acres or more.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 22 inches. It is mottled, pinkish gray silty clay in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is varved, reddish brown, gray, reddish gray, and weak red silty clay.

Included with this soil in mapping are small areas of the Lakemont, Schoharie, Niagara, Churchville, and Cosad soils. The Lakemont soils are wetter than this Odessa soil; the Schoharie soils are on small rises on the landscape; the Niagara soils are more silty than this Odessa soil; the Churchville soils are underlain by stony glacial till at a depth of 20 to 40 inches; and the Cosad soils have a 20- to 40-inch sandy overburden underlain by clayey lake sediments. Areas of included soils range up to 3 acres.

From December through May the Odessa soils have a perched water table in the upper part of the subsoil. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. There is usually no gravel in the soil. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

This soil has limited suitability for farm and urban uses. Current land use includes urban and suburban residential and commercial development and farming. Some areas are idle.

Seasonal wetness limits the suitability of this Odessa soil for cultivated crops. Erosion does not present a problem, but puddling and soil compaction are likely in wet seasons. Keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system improve tilth and maintain or improve crop yields. Artificial drainage is difficult to install because the soil is nearly level, and drains must be closely spaced because percolation is slow. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for crops grown in the county except early-market and long-season varieties.

Without adequate drainage this soil is best suited to hay and pasture. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricted plant growth, and the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is fair to good. Seasonal wetness is a limitation to equipment use. Trees rooted in this soil are able to withstand all but excessively strong winds. Without intensive site preparation and maintenance, plant competition will prevent regeneration of conifers.

The seasonally perched water table, low soil strength, poor soil compaction, clayey textures, and slow or very slow permeability are serious limitations for many urban uses of this soil (fig. 7). Septic tank absorption fields

Figure 7.—The seasonal high water table in these Odessa silt loam soils is a limitation for basements. Excavated material in the background is on the original soil surface.

need to be specially designed and installed because of the seasonal wetness and slow permeability of the soil. Basements are difficult to keep dry. Where the clayey subsoil is disturbed during construction, the soil is difficult to vegetate. This soil is a poor source of roadfill because of its low strength and high clay content. Some areas provide good sites for dugout ponds; but if the ponds are used for irrigation, they tend to refill slowly.

This Odessa soil is in capability subclass IIIw.

Oe—Odessa-Lakemont silt loams. This complex consists of the nearly level, somewhat poorly drained Odessa soil and poorly drained Lakemont soil in broad, flat areas that were the bottoms of glacial lakes. The two soils differ only slightly in elevation; the Odessa soil is about a foot or so above the Lakemont soil. This complex generally is on broad interfluves between major and intermittent drainageways. Areas of this complex are mainly irregular in shape, but they are roughly elongated when parallel to drainageways. Slope ranges from 0 to 3 percent. Individual areas range from 5 to 200 acres or more.

This complex is about 65 percent Odessa silt loam, 30 percent Lakemont silt loam, and 5 percent other soils. The Odessa and Lakemont soils form such an intricate pattern that it was not practical to separate them in mapping.

Typically the Odessa soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil is 13 inches thick. It is mottled, pinkish gray silty clay in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is varved, reddish brown, gray, reddish gray, and weak red silty clay.

Typically the Lakemont soil has a surface layer of very dark brown silt loam 9 inches thick. The subsurface layer is mottled, gray silty clay loam 4 inches thick. The subsoil is 16 inches thick. It is mottled, brown silty clay in the upper part and mottled, dark reddish gray silty clay in the lower part. The substratum is mottled, reddish brown silty clay loam.

There are very few soils included with this complex in mapping. In a few places the Lakemont soil has a mucky silt loam surface layer. In some areas, particularly adjacent to the Churchville or Cayuga soils, stony glacial till deposits are within 4 feet of the soil surface. Areas of included soils range up to 2 acres.

The Odessa soil has a perched water table in the upper part of the subsoil from December through May, and the Lakemont soil has an apparent high water table at or near the surface from November through June. Permeability is slow or very slow in the subsoil of Odessa soil and very slow in the Lakemont soil. The available water capacity is moderate to high. Runoff is slow on the Odessa soil and very slow or ponded on the Lakemont soil. There is usually no gravel in these soils, and bedrock is at a depth of 5 feet or more. Reaction in the Odessa soil is medium acid to neutral in the surface layer and medium acid to mildly alkaline in the subsoil; and in the Lakemont soil, reaction is slightly acid or neutral in the surface layer and subsoil.

This soil complex has very limited suitability for farm and urban uses. Most of the acreage is idle or wooded. Some areas are farmed or in urban developments.

Where feasible, drainage can make areas of this complex suitable for some cultivated crops. Erosion is not a problem, but puddling and soil compaction are likely if the soil is tilled when wet. This complex is very difficult to drain because it has slow or very slow permeability, there are only a few drainage outlets, and the soil pattern is complex. This complex is suitable for some crops grown in the county, if it is adequately drained and high fertility is maintained, tillage is kept to a minimum, cover crops are used, and grasses and legumes are included in the cropping system. However, this complex is not suited to early-market and long-season varieties. Without adequate drainage this complex is better suited to wetness-tolerant hay crops and pasture.

Grazing when the soil is wet is a major concern of pasture management. It can cause soil compaction, restricted plant growth, and the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, deferment of grazing during wet periods, and restricting grazing to the drier Odessa soil when appropriate are the chief management needs.

The potential for wood crops is fair to good on the somewhat poorly drained Odessa soil, but it is poor on the wetter Lakemont soil. The prolonged wetness, particularly on the Lakemont soil, seriously limits use of planting equipment and causes high seedling mortality. Without intensive site preparation and maintenance, plant competition will prevent the regeneration of conifers. Root development is much better on the Odessa soil than on the wetter Lakemont soil, and the uprooting of trees is less of a hazard.

This complex is severely limited for urban use by seasonal or prolonged wetness, slow or very slow permeability, low soil strength, clayey textures, and poor stability of cut slopes. If buildings, roads, septic tank absorption fields, or other urban facilities are to be installed in spite of the limitations, they should be confined to the higher, somewhat poorly drained Odessa soil. If the clayey subsoil is disturbed during construction, it becomes difficult to recompact and is subject to settling under a load. This complex is well suited to development of wetland wildlife habitat. Because these soils are slowly or very slowly permeable and the Lakemont soil is in natural depressions, this complex is well suited to excavated ponds.

This Odessa-Lakemont complex is in capability subclass IVw.

OrA—Orpark silty clay loam, 0 to 3 percent slopes. This nearly level soil is moderately deep and somewhat poorly drained. It formed in acid glacial till deposits underlain by soft bedrock at a depth of 20 to 40 inches. This soil is on the flat ledges and ridge crests of the shelflike northern edge of the upland plateau. Areas of this soil are 5 to 100 acres or more and are generally elongated or irregular in shape. This soil usually receives some seepage but not much runoff from higher adjacent soils.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 9 inches thick. The subsoil is light olive brown and olive brown silty clay loam about 13 inches thick. The substratum is mottled, pale olive silty clay loam about 5 inches thick. Olive, soft shale bedrock is at a depth of 27 inches.

Included with this soil in mapping are small areas of the slightly deeper Derb soils and the less acid Angola soils. Occasional depressional wet spots are indicated by a special symbol on the soil map. Areas of included soils range from 1/4 acre to 2 acres.

This Orpark soil has a perched seasonal high water table in the upper part of the subsoil from November through May. The root zone is restricted by this water table and by the underlying bedrock at a depth of 20 to 40 inches. Permeability is moderate in the surface layer and slow or moderately slow in the subsoil. The available water capacity is moderate, and runoff is slow to medium. Shale fragments are usually less than 10 percent throughout the soil. This soil is strongly acid or very strongly acid.

This soil is poorly suited to many uses because of seasonal wetness and moderate depth to bedrock. Many areas are used for hay, pasture, or woodland. Some areas are idle.

This Orpark soil is not suited to cultivated crops, unless drained. Subsurface drainage is difficult to install because of the underlying bedrock. Even with drainage, the potential of this soil for crops is only fair because fertility is low and liberal applications of lime are needed to reduce natural acidity.

This soil is often better suited to hay crops and pasture than to cultivated crops. Grazing when the soil is wet causes puddling and soil compaction and leads to poorer quality pasture.

Timber production on this soil is fair. Rooting depth is limited by wetness and by the moderate depth to bedrock; therefore, certain trees tend to uproot during windstorms. Seasonal wetness also limits the use of planting and harvesting equipment and increases seedling mortality.

Moderate depth to bedrock and seasonal wetness are serious limitations for most urban uses of this soil. They affect highways, sewers and pipelines, buildings with basements, and septic tank absorption fields. Drains can be used to minimize the wetness around foundations. Installation of drains is difficult because of the underlying bedrock, although the rock is rippable. Moderately slow or slow permeability in the subsoil is also a limitation for some uses. Liberal applications of lime and fertilizer are needed to establish and maintain lawns.

This Orpark soil is in capability subclass IIIw.

OrB—Orpark silty clay loam, 3 to 8 percent slopes. This gently sloping soil is moderately deep and somewhat poorly drained. It formed in acid glacial till deposits underlain by soft shale bedrock at a depth of 20 to 40 inches. This soil is on side slopes adjacent to nearly flat benches and on ridge crests of the shelflike northern edge of the upland plateau. Areas of this soil range from 5 to 200 acres and are generally elongated to irregular in shape. This soil commonly receives runoff from higher adjacent soils.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 9 inches thick. The subsoil is light olive brown and olive brown silty clay loam about 13 inches thick. The substratum is mottled, pale olive silty clay loam about 5 inches thick. Olive, soft shale bedrock is at a depth of 27 inches.

Included with this soil in mapping are small areas of the slightly deeper Derb soils, the less acid Angola soils, and the sloping Orpark soils. Occasional depressional wet spots are indicated by a special symbol on the the soil map. Areas of included soils range from 1/4 acre to 2 acres.

This Orpark soil has a perched seasonal high water table in the upper part of the subsoil from November through May. The root zone is restricted by the seasonal high water table and by underlying bedrock at a depth of 20 to 40 inches. Permeability is moderate in the surface layer and slow or moderately slow in the subsoil and substratum. The available water capacity is moderate, and runoff is medium. Shale fragments are usually less than 10 percent throughout the soil. This soil is strongly acid or very strongly acid, unless limed.

This soil is poorly suited to many uses because of seasonal wetness and moderate depth to bedrock. Many areas are used for hay, pasture, or woodland. Some areas are idle.

This Orpark soil is not suited to cultivated crops, unless drained. Subsurface drainage is difficult to install because of the underlying bedrock. Even with drainage, the potential of this soil for crops is only fair because fertility is low and liberal applications of lime are needed to reduce natural acidity. Erosion is a hazard in intensively cultivated areas. Tilling across slopes, using cover crops, keeping tillage to a minimum, and including sod crops in the cropping system reduce the hazard of water erosion.

This soil is often better suited to hay and pasture than to cultivated crops. Grazing when the soil is wet causes puddling and soil compaction and leads to poorer quality pasture.

Timber production on this soil is fair. Rooting depth is limited by wetness and by the moderate depth to bedrock; therefore certain trees tend to uproot during windstorms. Seasonal wetness also limits the use of planting and harvesting equipment and increases seedling mortality. Placing logging trails across the slope reduces the hazard of trail gullying.

Moderate depth to bedrock, slow or moderately slow permeability, and seasonal wetness are severe limitations for most urban uses of this soil. They affect highways, sewers and pipelines, buildings with basements, and septic tank absorption fields. Interceptor drains that divert runoff and seepage minimize the wetness around foundations. Installation of drains is difficult because of the underlying bedrock, although the rock is usually rippable. Because this silty soil is erosive, construction sites should be revegetated as quickly as possible. Liberal applications of lime and fertilizer are needed to establish and maintain plant cover or lawns.

This Orpark soil is in capability subclass IIIw.

OrC—Orpark silty clay loam, 8 to 15 percent slopes. This sloping soil is moderately deep and somewhat poorly drained. It formed in acid glacial till deposits underlain by soft shale bedrock at a depth of 20 to 40 inches. This soil is in long, narrow areas on the sides of benches and the shelflike northern edge of the upland plateau. Some areas are on hillsides. Areas of this soil are 5 to 200 acres in size and are generally elongated to oblong. This soil usually receives some seepage or runoff from adjacent higher soils.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 9 inches thick. The subsoil is light olive brown and olive brown silty clay loam about 13 inches thick. The substratum is mottled, pale olive silty clay loam about 5 inches thick. Olive, soft shale bedrock is at a depth of 27 inches.

Included with this soil in mapping are small areas of the slightly deeper Derb soils, the moderately well drained Schuyler soils on convex shoulder slopes, and a few areas of the Angola soils that are less acid than this Orpark soil. In some areas, the slope is moderately steep, or bedrock is within 20 inches of the surface. Occasional seep spots at the base of slopes are indicated by a special symbol on the soil map. Areas of included soils range from 1/4 acre to 3 acres.

This Orpark soil has a perched seasonal high water table in the upper part of the subsoil from November through May. The root zone is limited by the seasonal high water table and by underlying bedrock at a depth of 20 to 40 inches. Permeability is moderate in the surface layer and slow or moderately slow in the subsoil. The available water capacity is moderate, and runoff is rapid. Shale fragments are usually less than 10 percent throughout the soil. Unless limed, this soil is strongly acid or very strongly acid.

This soil is poorly suited to most uses because of seasonal wetness, slope, and moderate depth to bedrock. Many areas are in woodland or are idle. Some areas are pasture or hayland.

This Orpark soil is poorly suited to cultivated crops unless drained and protected from erosion. Subsurface drainage is difficult to install because of the underlying bedrock. Even with drainage, the potential for crops is only fair because fertility is low and liberal applications of lime are needed to reduce natural acidity. Interceptor drains divert runoff and seepage from higher, adjacent soils. The erosion hazard is severe in intensively cultivated areas.

This soil is often better suited to hay and pasture than to cultivated crops. Grazing when the soil is wet causes puddling and soil compaction and leads to poorer quality pasture.

Timber production on this soil is fair. Rooting depth is limited by wetness and by the moderate depth to bedrock; therefore, certain tree species tend to uproot during windstorms. Seasonal wetness also limits the use of planting and harvesting equipment and increases seedling mortality. Placing logging trails across the slope reduces the hazard of trail gullying and erosion.

Moderate depth to bedrock, slope, moderately slow or slow permeability, and seasonal wetness are serious limitations for most urban uses. They affect highways, sewers and pipelines, buildings with basements, and septic tank absorption fields. Interceptor drains that divert runoff and seepage minimize the wetness around foundations. Installation of drains is difficult because of the underlying bedrock, although the rock is rippable. This silty soil is very erosive and when it is disturbed during construction, vegetative cover should be reestablished as soon as possible. Liberal applications of lime and fertilizer are needed to establish and maintain lawns.

This Orpark soil is in capability subclass IIIe.

OvA—Ovid silt loam, 0 to 3 percent slopes. This nearly level soil is somewhat poorly drained. It is in broad, flat areas of till plains, which are often adjacent to glacial lakebeds. This soil formed in reddish glacial till or lacustrine sediment that has been reglaciated and mixed with till. Areas of this soil are irregular in shape and range from 5 to 200 acres or more.

Typically, this soil has a surface layer of very dark grayish brown silt loam 10 inches thick. The subsoil extends to a depth of 20 inches. The upper 2 inches is mottled, brown light silty clay loam, and the lower part is mottled, dark brown clay loam. The substratum is mottled, reddish brown gravelly loam.

Included with this soil in mapping are small areas of the Kendaia, Appleton, Churchville, and Ilion soils. The Kendaia and Appleton soils have a lower clay content in the subsoil than this Ovid soil. The Churchville soils have a moderately deep layer of clayey sediments. Most areas of the poorly drained Ilion soils are in wet spots and drainageways. Areas of included soils range from 1/2 acre to 3 acres.

From January through May this Ovid soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is slow. Gravel makes up 0 to 15 percent of the surface layer. Bedrock is generally many feet deep, but may be as little as 5 feet deep. Unless limed, the surface layer is medium acid or slightly acid and the subsoil is medium acid to neutral.

Because of seasonal wetness and slow permeability, this soil is only moderately suited to farming and is poorly suited to many urban uses. Most of the acreage is farmed, in woodland, or idle. A few areas are urbanized.

This Ovid soil is only moderately suited to cultivated crops, unless drained. Subsurface drains generally require close spacing to be effective. Erosion is not a problem on this nearly level soil, but it may puddle and compact if tilled when wet. Keeping tillage to a minimum, using cover crops, plowing at the proper soil moisture level, and including grasses and legumes in the cropping system improve tilth and increase crop yields. Drainage is difficult to install because of the nearly level slopes and slowly permeable substratum; but with adequate drainage and maintenance of tilth and fertility, this soil is suitable for many crops grown in the county, except for early-market and long-season varieties.

Without adequate drainage this soil is better suited to hay or pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. They cause soil compaction and trampling of forage plants, which lead to reduced plant growth and the eventual loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is fair to good. Erosion is usually not a hazard, but seasonal wetness causes moderate seedling mortality and limits the use of equipment. The seasonal high water table also limits rooting depth, which can result in uprooting of trees during windstorms. Trees that can withstand high lime conditions are best suited to this soil.

The seasonal high water table, slow permeability in the substratum, and danger of frost heave are serious limitations for many urban uses of this Ovid soil. Drains around foundations are needed to minimize wetness. Some areas are suitable sites for recreation, such as picnic areas and hiking trails. Many areas are good sites for dugout ponds.

This Ovid soil is in capability subclass IIIw.

OvB—Ovid silt loam, 3 to 8 percent slopes. This gently sloping soil is somewhat poorly drained. It is in low, undulating, slightly concave areas on lower sideslopes, along field drainageways, and in shallow depressions. This soil formed in red glacial till or lacustrine sediments that were reglaciated and mixed with till. Areas of this soil are oblong or irregular in shape and range from 3 to 50 acres or more.

Typically, this soil has a surface layer of very dark grayish brown silt loam 10 inches thick. The subsoil extends to a depth of 20 inches. The upper 2 inches is mottled, brown light silty clay loam, and the lower part is mottled, dark brown clay loam. The substratum is mottled, reddish brown gravelly loam to a depth of 60 inches.

Included with this soil in mapping are small areas of the Cazenovia, Kendaia, Appleton, Churchville, and Ilion soils. The well drained and moderately well drained Cazenovia soils are on a few small convex knolls. The Kendaia and Appleton soils have a lower clay content in the subsoil than this Ovid soil. The Churchville soils have a moderately deep layer of clayey sediments. The poorly drained Ilion soils are in wet spots and the bottom of drainageways. Areas of included soils range from 1/2 acre to 3 acres.

From January through May this Ovid soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is moderately slow in the subsoil and slow in the substratum. The available water capacity is moderate to high, and runoff is slow to medium. Gravel makes up 0 to 15 percent of the surface layer. Bedrock is generally many feet deep, but may be as little as 5 feet deep. Unless limed, the surface layer is medium acid or slightly acid and the subsoil is medium acid to neutral.

Because of seasonal wetness and slow permeability, this soil is only moderately suited to farming and is poorly suited to many urban uses. Most of the acreage is farmed, in woodland, or idle. A few areas are urbanized.

This Ovid soil is moderately suited to cultivated crops, unless drained. Subsurface drains generally require close spacing to be effective. Interceptor drains divert runoff and seepage. Erosion is a moderate hazard, and puddling and soil compaction are problems if the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, plowing at the proper soil moisture level, tilling across slopes, and including grasses and legumes in the cropping system improve tilth, increase crop yields, and control erosion. This gently sloping soil is often easier to drain than the nearly level Ovid soil because suitable outlets are available. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for many crops grown in the county, except for early-market and long-season varieties.

Without adequate drainage, this soil is often better suited to hay crops or pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. Overgrazing can cause the loss of the pasture seeding. Grazing when the soil is wet can cause soil compaction and trampling of forage plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is fair to good. Erosion is usually not a hazard, but seasonal wetness causes moderate seeding mortality and limits the use of equipment on this soil. The seasonal high water table also limits rooting depth, which can result in the uprooting of trees during windstorms.

The seasonal high water table, slow permeability in the substratum, and danger of frost heave are serious limitations for many urban uses of this Ovid soil. Drains around foundations and interceptor drains placed upslope from buildings minimize the wetness. Many areas are good sites for diked ponds.

This Ovid soil is in capability subclass IIIw.

Pa—Palms muck. This nearly level organic soil is deep and very poorly drained. It is in basinlike areas on the lowland lake plain and in depressions on the upland plateau. The organic material is well decomposed and 16 to 50 inches thick. It is underlain by loamy mineral soil. Areas of this soil are roughly oval or irregular in shape and range from 3 to 50 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a black, well decomposed, organic (muck) surface layer about 12 inches thick. The subsurfce layer extends to a depth of about 38 inches. It is friable, black to dark grayish brown well decomposed muck. The mineral substratum below a depth of about 38 inches is dark gray to gray loam.

Included with this soil in mapping are small intermingled areas of the Canandaigua, Lamson, and Lyons soils that have a mucky surface layer. These soils formed in organic deposits that are less than 16 inches deep. The Canandaigua soils have a silty subsoil, the Lamson soils have a high sand content in the subsoil, and the Lyons soils have gravel and stones mixed with the mineral material. These mineral soils generally are narrow bands around the edge of this map unit or on slight rises within the unit. Also included in mapping are small areas of muck deposits deeper than 50 inches, usually near the center of the mapped area. Areas of included soils range up to 3 acres.

This Palms soil is subject to frequent flooding or ponding. It has a high water table at or near the soil surface from November through May. Permeability is moderately slow to moderately rapid in the organic layers and moderate or moderately slow in the loamy mineral substratum. The available water capacity is high, and runoff and internal drainage are very slow. Bedrock is at a depth of more than 6 feet. The organic layers range from strongly acid to moderately alkaline.

Palms muck, where drained, is well suited to special crops and many field crops. It has very serious limitations for urban and recreational uses, mainly because of excessive wetness, flooding, and instability. Most of the acreage is in cattails and other water-tolerant grasses, sedges, brush, and trees. A few areas are drained and farmed.

This Palms soil is well suited to many cultivated crops, particularly vegetable crops, if it is properly drained. Drainage usually requires a system of open ditches and subsurface drains. Drainage is extremely difficult to install in many areas because the soil is low on the landscape and suitable outlets are not available. If the soil is drained, keeping tillage to a minimum, using cover crops, plowing at proper soil moisture level, and rotating crops help maintain good tilth and reduce the loss of organic matter. If this organic soil is drained and left idle it is subject to wind erosion, but by maintaining windbreaks and cover crops or sod crops on the soil this hazard is reduced. Using equipment that minimizes soil compaction helps maintain tilth and a good rate of water percolation through the soil. Lettuce, onions, and potatoes do very well in drained areas of this muck soil.

Undrained areas are usually poorly suited to pasture or hay crops. Soil compaction and trampling of desirable grasses are serious problems in pastured areas.

The potential of this soil for wood crops is poor because of prolonged wetness. Use of equipment, seedling mortality, and uprooting of trees during windstorms are very serious problems on this soil. Only seedlings that can withstand excessive wetness can be grown.

Prolonged wetness, seepage, excess humus, frequent flooding or ponding, compressibility, and high risk of frost damage are severe limitations for most urban and recreational uses of this soil. Many areas are suited to wetland wildlife habitat.

This Palms muck soil is in capability subclass Vw.

PbA—Palmyra gravelly loam, 0 to 3 percent slopes. This nearly level soil is deep and well drained. It is on flat terraces and plains in the northern part of the county. This loamy soil is derived from outwash deposits that have a relatively high content of sand and limestone gravel. Areas of this soil are large and oblong or irregular in shape, and range from 3 to 200 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown gravelly loam 9 inches thick. The subsoil extends to a depth of 28 inches. It is brown gravelly loam in the upper part, brown gravelly heavy loam in the middle part, and brown gravelly light clay loam in the lower part. The grayish brown substratum is very gravelly loamy sand in the upper part and very gravelly sand in the lower part.

Included with this soil in mapping are small areas of the Phelps, Halsey, Arkport, and Minoa soils. The Phelps soils are not as well drained as this Palmyra soil and are on slightly lower terraces. The Halsey soils are in wet depressions and in other low areas. The well drained Arkport soils and the somewhat poorly drained Minoa soils are free of gravel and cobblestones. Also included are a few areas of a gently sloping soil. Areas of included soils range from 1/4 acre to 3 acres.

The permeability of this Palmyra soil is moderate in the surface layer and subsoil and very rapid in the substratum. The available water capacity is moderate, and runoff is slow. Depth to bedrock is 5 feet or more. Gravel makes up 15 to 30 percent of the surface layer. In unlimed areas, the surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

This soil is well suited to farming and to many urban uses. Most of the acreage is urbanized or is farmed. A few small areas of this soil are idle.

This Palmyra soil is well suited to cultivated crops. Gravel in the surface layer interferes with the planting and harvesting of some specialized crops and causes more rapid wear of equipment. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and occasionally including sod crops in the cropping system help maintain tilth and improve the organic matter content. This soil is suited to irrigated vegetable crops, and irrigation systems are easier to manage than on the more sloping Palmyra soil.

Pasture and hay crops also do well on this soil. Overgrazing restricts plant growth and can cause the loss of the pasture plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet or extremely dry are the chief management needs.

The potential of this soil for wood crops is good, although only a very few areas are wooded. There are few restrictions for the use of equipment on this soil. Erosion is not a hazard, and seedling mortality and the uprooting of trees are generally not a problem, but seedlings should be planted early in the spring when the soil is moist. Most areas are suited to machine planting of seedlings.

This soil has only a few limitations for urban and recreation uses. The rapid leaching of septic tank absorption fields can contaminate the ground water because the substratum is very rapidly permeable. Gravel is bothersome when lawns and gardens are being established and is a serious limitation for playgrounds and athletic fields. The substratum is usually an excellent source of sand and gravel.

This Palmyra soil is in capability class I.

PbB—Palmyra gravelly loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on undulating terraces and plains in the northern part of the county. This loamy soil is derived from outwash deposits that have a relatively high content of sand and limestone gravel. Areas of this soil are large and irregular in shape, and range from 3 to 200 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown gravelly loam 9 inches thick. The subsoil extends to a depth of 28 inches. It is brown gravelly loam in the upper part, brown gravelly heavy loam in the middle part, and brown gravelly light clay loam in the lower part. The grayish brown substratum is very gravelly loamy sand in the upper part and very gravelly sand in the lower part.

Included with this soil in mapping are small areas of the Phelps, Halsey, Arkport, and Minoa soils. The Phelps soils are not as well drained as this Palmyra soil and are on foot slopes. The Halsey soils are in wet depressions and other low areas. The well drained Arkport and the somewhat poorly drained Minoa soils are free of gravel and cobblestones and are in dominantly sandy deposits. Also included are a few areas of a nearly level soil. Areas of included soils range from 1/4 acre to 3 acres.

The permeability of this Palmyra soil is moderate in the surface layer and subsoil and very rapid in the substratum. The available water capacity is moderate, and runoff is medium. Depth to bedrock is 5 feet or more. Gravel makes up 15 to 30 percent of the surface layer. In unlimed areas, the surface layer is medium acid to neutral, and the subsoil is slightly acid to mildly alkaline.

This soil is well suited to farming and to many urban uses. Most of the acreage is urbanized or is farmed. A few small areas are idle.

This Palmyra soil is suited to cultivated crops. Gravel in the surface layer interferes with the planting and harvesting of some specialized crops and also causes more rapid wear of equipment. Erosion is a moderate hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling across slopes and including sod crops in the cropping system help maintain tilth, control erosion, and improve the organic matter content. This soil is suited to irrigation of vegetable crops, but irrigation systems are more difficult to manage than on the nearly level Palmyra soil.

Pasture and hay crops also do well on this soil. Overgrazing can restrict plant growth and cause the loss of the pasture plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet or extremely dry are the chief management needs. This soil seldom needs liming.

The potential of this soil for wood crops is good, although only a very few areas are wooded. There are few restrictions in the use of equipment on this soil. Erosion is not a hazard, and seedling mortality and the uprooting of trees are generally not problems, but seedlings should be planted early in the spring when the soil is moist. Most areas are suited to machine planting of seedlings.

This soil has only a few limitations for urban and recreational uses. Most areas are excellent homesites, but disturbed areas should be reseeded as soon after construction as possible to prevent erosion and sedimentation. The leaching of septic tank absorption fields can contaminate the ground water because the substratum is very rapidly permeable. Gravel is bothersome when lawns and gardens are being established and is a serious limitation for playgrounds and athletic fields. The substratum is usually an excellent source of sand and gravel.

This Palmyra soil is in capability subclass IIe.

Pc—Patchin silt loam. This nearly level soil is moderately deep and poorly drained and very poorly drained. It formed in a mantle of glacial till underlain by shale bedrock. It is in depressional areas of uplands that receive runoff from adjacent soils. Slope is 0 to 3 percent. Areas of this soil are oblong or irregular in shape and range from 3 to 80 acres, but areas of 5 to 40 acres are most common.

Typically, this soil has a surface layer of mottled, dark grayish brown silt loam about 10 inches thick. The subsurface layer is mottled, light brownish gray silt loam about 4 inches thick. The subsoil extends to a depth of 23 inches. It is mottled, dark grayish brown light silty clay loam in the upper part and is mottled, grayish brown shaly silt loam in the lower part. Soft shale bedrock is at a depth of 23 inches.

Included with this soil in mapping are small intermingled areas of the Hornell, Derb, and Orpark soils.

The Hornell soils have a higher clay content in the subsoil than this Patchin soil. The somewhat poorly drained Derb soils are on slightly raised benches underlain by bedrock at a depth of more than 40 inches. The somewhat poorly drained Orpark soils are on adjacent foot slopes and slightly elevated benches. Areas of included soils range from 1/4 acre to 3 acres.

From October through June this Patchin soil has a perched water table at or near the soil surface. Permeability is moderately slow in the surface layer and slow in the subsoil. The available water capacity is moderate, and internal drainage and runoff are slow. Soft shale bedrock is at a depth of 20 to 40 inches. Shale fragments make up as much as 10 percent of the surface layer and subsoil. In unlimed areas, the surface layer and subsoil are strongly acid or very strongly acid.

Because of prolonged wetness, this soil has limited suitability for most farm and urban uses. Most of the acreage is woodland, or it is idle and provides habitat for wetland wildlife.

This Patchin soil is poorly suited to cultivated crops; however, if adequate outlets are available and the soil is drained, satisfactory yields can be obtained. Locating adequate drainage outlets is difficult because this soil is low on the landscape. Bedrock at a depth of 20 to 40 inches hinders the installation of subsurface drains. In drained areas, keeping tillage to a minimum, using cover crops, using liberal applications of lime, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth, improve the organic matter content, and increase crop yields.

Unless drained, this soil is poorly suited to hay but can be used for low-yielding pasture. Partial drainage considerably improves the use of this soil for pasture. Grazing when the soil is wet causes soil compaction and puddling and trampling of pasture grasses. Native pasture generally responds well to applications of lime and fertilizer.

The potential of this soil for wood crops is poor. Prolonged wetness causes high seedling mortality and limits the use of equipment on this soil. It limits root development, which can result in the uprooting of trees during windstorms. Trees that can withstand a prolonged high water table are best suited to this soil.

Prolonged wetness and moderate depth to bedrock are severe limitations for most urban uses of this soil. Because of bedrock, subsurface drains are difficult to install around foundations. Some areas have good potential for wildlife habitat, particularly for wetland wildlife.

This Patchin soil is in capability subclass IVw.

PhA—Phelps gravelly loam, 0 to 3 percent slopes. This nearly level soil is deep and moderately well drained. It formed in water-laid deposits of sand, silt, and gravel. This soil is on moderately low flats of outwash plains and on low terraces. Areas of this soil are irregular in shape and range from 3 to 50 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown gravelly loam about 10 inches thick. The subsoil extends to a depth of 32 inches. The upper 18 inches is mottled, brown gravelly heavy loam, and the lower 4 inches is mottled, yellowish brown gravelly sandy loam. The substratum to a depth of 50 inches or more is stratified brown and grayish brown very gravelly loamy sand.

Included with this soil in mapping are small intermingled areas of the Palmyra and Red Hook soils. The Palmyra soils are similar to this Phelps soil but are well drained and are on the small, higher knolls. The somewhat poorly drained Red Hook soils are in slight depressions. Also included in mapping are small areas of the Phelps soils that have a surface layer of finely gravelly loam. Areas of included soils range up to 3 acres.

In the spring this Phelps soil has a seasonal high water table in the lower part of the subsoil. Permeability is moderate in the subsoil and moderately rapid to rapid in the sand and gravel substratum. The available water capacity is moderate, and runoff is slow. Gravel makes up 15 to 35 percent of the surface layer. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction of the surface layer and upper part of the subsoil is medium acid to neutral.

This soil is suited to farming but has some limitations for most urban uses. Most areas are farmed or in residential development. A few areas of this soil are idle.

This Phelps soil is suited to cultivated crops. Seasonal wetness is a limitation for early-season tillage. Gravel in the surface layer interferes with planting and cultivation of some specialized crops and causes excessive wear of equipment. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth, improve the organic matter content, and increase crop yields. Increasing the organic matter content improves the available water capacity of the soil. This soil responds well to irrigation in the drier summer months. Included wet spots are usually easy to drain.

This soil is well suited to pasture and hay. Overgrazing and grazing when the soil is wet are the main management concerns. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods help maintain high quality pasture.

The potential of this soil for wood crops is good. The hazard of erosion, equipment limitations, seedling mortality, and uprooting of trees during windstorms are slight limitations. Seedings should be planted early in the spring when the soil is moist.

The temporary seasonal high water table, seepage, and high frost damage potential are limitations for many urban uses of this soil. The contamination of ground water is a hazard where the soil is used for septic tank absorption fields, because the substratum is moderately rapidly or rapidly permeable. Dwellings with basements are difficult to keep dry, but subsurface drains around foundations minimize the wetness. Frequent watering during dry periods and fertilization help maintain quality lawns and shrubs. This soil is a fair source of sand or gravel.

This Phelps soil is in capability subclass IIw.

PhB—Phelps gravelly loam, 3 to 8 percent slopes. This deep, gently sloping soil is deep and moderately well drained. It formed in water-laid deposits of sand, silt, and gravel. This soil is in moderately low areas of outwash plains and on low, undulating terraces. Areas of this soil are oblong and range from 3 to 50 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown gravelly loam about 10 inches thick. The subsoil extends to a depth of 32 inches. The upper 18 inches is mottled, brown gravelly heavy loam, and the lower part is mottled, yellowish brown gravelly sandy loam. The substratum to a depth of 50 inches or more is stratified brown and grayish brown very gravelly loamy sand.

Included with this soil in mapping are small intermingled areas of the Palmyra and Red Hook soils. The Palmyra soils are similar to this Phelps soil but are well drained and are on the higher knolls. The somewhat poorly drained Red Hook soils are in slight depressions and along shallow drainageways. Also included in mapping are small areas of the Phelps soils that have a surface layer of finely gravelly loam. Areas of included soils range from 1/4 acre to 3 acres.

In the spring this Phelps soil has a seasonal high water table in the lower part of the subsoil. Permeability is moderate in the subsoil and moderately rapid to rapid in the sand and gravel substratum. The available water capacity is moderate, and runoff is medium. Gravel makes up 15 to 35 percent of the surface layer. Bedrock is at a depth of more than 5 feet. In unlimed areas, reaction of the surface layer and upper part of the subsoil is medium acid to neutral.

This soil is suited to farming but has some limitations for most urban uses. Most of the areas are farmed or in residential development. A few areas of this soil are idle or woodland.

This Phelps soil is suited to cultivated crops. Temporary seasonal wetness is a limitation for early season tillage. Gravel in the surface layer interferes with planting and cultivation of some specialized crops and causes excessive wear of equipment. Erosion can be a hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth, control erosion, improve the organic matter content, and increase crop yields. Increasing the organic matter content improves the available water capacity of the soil. This soil responds well to irrigation in the drier summer months but is more difficult to irrigate than the nearly level Phelps soil. Included wet spots are usually easy to drain.

This soil is well suited to pasture and hay. Overgrazing and grazing when the soil is wet are the main management concerns. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods maintain high quality pasture.

The potential of this soil for wood crops is good. The hazard of erosion, equipment limitations, seedling mortality, and uprooting of trees during windstorms are slight limitations. Seedlings should be planted early in the spring when the soil is moist.

The temporary seasonal high water table, seepage, and high frost damage potential are limitations for many urban uses of this soil. The contamination of ground water is a hazard where the soil is used for septic tank absorption fields, because the substratum is moderately rapidly or rapidly permeable. Dwellings with basements are difficult to keep dry, but subsurface drains around foundations or interceptor drains minimize this problem. Frequent watering during dry periods and fertilization help maintain quality lawns and shrubs. This soil is a fair source of sand or gravel.

This Phelps soil is in capability subclass IIw.

Pt—Pits, borrow. Pits are excavated areas from which loamy material has been removed to use as fill in other areas. They are about 3 to 10 feet deep. The soil material in these pits is well drained to somewhat poorly drained. The sides of the pits are usually steep, and the floor is relatively level. Stones and boulders are commonly scattered over the floor. Included in mapping are small pools of water on some pit floors. A few abandoned pits are ponded with water throughout the year. The excavated areas are commonly irregular in shape, depending on the nature of the adjacent soils and ownership boundaries, and they range from 1 to 150 acres or slightly more.

These borrow pits are generally devoid of vegetation; however on some of the older ones there are scattered bushes and grass. The pits range from dry to moist depending on the soil deposits and their position on the landscape. Permeability varies, but usually it is moderately slow to very slow on pit floors.

This map unit is generally poorly suited to farming and woodland because the topsoil has been removed and the subsoil material is not suitable for root development. Generally, the potential is poor for wildlife habitat, although birds and animals, such as woodchucks, may find shelter or refuge in some of these areas.

The suitability of these areas for urban and recreation uses ranges from good to poor. Most sites require regrading and landscaping for such uses, but onsite investigations are essential, and each site must be considered individually.

Pits, borrow, have not been assigned a capability subclass.

Pu—Pits, gravel. This unit consists of excavated areas from which gravel has been removed for construction purposes. They are usually 5 to about 50 feet deep. The soils in these areas have a high sand and gravel content. Pit sides are mostly steep, and the floor is relatively level. Piles of stones and boulders and sloughed materials are commonly scattered over the floor. Small pools of water are common in low parts of some of the pits, particularly in the spring. These excavated areas are commonly irregular in shape, depending on the nature of the soil deposits and ownership boundaries, and they range from 3 to 200 acres or more.

Pits are usually devoid of vegetation; however in some of the older ones there are scattered bushes and grass. Pits are droughty because of the very low available water capacity of the soil. Permeability varies, but usually it is moderately rapid to very rapid.

These miscellaneous areas are generally not suited to farming and woodland because the topsoil has been removed and the subsoil material is not suitable for root development. The potential of these areas is usually poor for wildlife habitat, although some animals and birds may find shelter or refuge in these areas.

The suitability of these areas for urban and recreational uses ranges from good to poor. Onsite investigations are essential and each site must be considered individually.

Pits, gravel, have not been assigned a capability subclass.

Qu—Quarries. These are open pits created by removing limestone rock for agricultural, industrial, and construction purposes. They are mainly in the northern part of the county, and the surrounding soils are usually shallow over bedrock. The excavated areas are usually 20 to 100 feet deep. They are irregular in shape, depending on the nature of the bedrock strata and ownership boundaries. They range from 3 to 125 acres or more.

Quarries are generally devoid of vegetation; however, in some of the older quarries, scattered plants and grass have become established in cracks where the bedrock has weathered and some soil has accumulated. Piles of stones and boulders are commonly scattered over the quarry floor. Included in mapping are small pools of water on many of the quarry floors. The entire floor of some abandoned quarries is covered with water up to several feet deep.

The suitability of abandoned areas for some urban and recreational uses ranges from poor to fair. Onsite investigation is necessary, and each site is considered individually for any proposed use.

Some areas are well suited to educational uses, such as outdoor classrooms for studying the bedrock geology of the region. Onsite investigation is needed to determine the feasibility of using Quarries for such purposes.

Abandoned Quarries are usually poorly suited to farming and woodland becuase of the lack of soil material. Some areas provide habitat for certain kinds of wildlife and birds, and a few areas that are ponded contain fish and other aquatic animals. Boating is also possible in some of the pits that are ponded. Where trash and other wastes are dumped in abandoned quarries there is a hazard of pollution of the water table by seepage through the cavernous and fractured limestone bedrock.

Quarries are not assigned a capability subclass.

RaA—Raynham silt loam, 0 to 3 percent slopes. This level or nearly level, silty soil is deep and somewhat poorly drained. It is mainly on broad plains in the lowlands in the northern part of the county and in small pockets on the upland plateau. Areas of this soil are irregular in shape or roughly elongated where they parallel streams. Most areas range from 50 to 200 acres or more, but in the uplands, areas range from 3 to 50 acres in size.

Typically, this soil has a surface layer of dark grayish brown silt loam about 8 inches thick. The subsoil is about 18 inches thick. It is mottled, yellowish brown silt loam. The substratum extends to a depth of 60 inches. The upper part is mottled, yellowish brown silt loam, and the lower part is grayish brown fine sand.

Included with this soil in mapping are small areas of the Minoa and the Niagara soils. The Minoa soils are more sandy and the Niagara soils are more clayey than this Raynham soil. Also included are soils that are similar to this Raynham soil but have a dense fragipan in the subsoil. In some areas, particularly in the uplands, the subsoil is more acid than is typical for this Raynham soil. Areas of included soils range from 1/2 acre to 3 acres.

From November through June this Raynham soil has a seasonal high water table in the upper part of the subsoil. Permeability is moderate or moderately slow in the subsoil and slow in the substratum. The available water capacity is high, and internal drainage and runoff are slow. There is usually no gravel in this soil, and bedrock is more than 5 feet deep. The surface layer and subsoil are strongly acid to neutral.

This soil is moderately suited to farming but poorly suited to many urban uses. Most of the acreage is in hay, pasture, woodland, or it is idle. Some areas of this soil are in residential development.

The suitability of this Raynham soil for cultivated crops can be improved with drainage. In undrained areas, seasonal wetness delays planting until late spring.

Puddling and soil compaction are hazards if the soil is tilled when wet. Erosion is not a problem on this nearly level soil, except where the subsoil is exposed in open ditches. If properly drained, this gravel- and stone-free soil is easy to till and is productive for many crops. Keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system help maintain good tilth.

Without adequate drainage, this soil is best suited to hay or pasture. Overgrazing and grazing when the soil is wet are major concerns of management. Overgrazing can cause the loss of the pasture seeding, and grazing when the soil is wet can cause soil compaction, restrict plant growth, and lead to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and restricted grazing during wet periods help keep pastures productive.

The potential of this soil for wood crops is fair. Seasonal wetness increases seedling mortality, limits the use of planting and harvesting equipment, and restricts rooting depth. Because of the restricted rooting depth, trees are more susceptible to uprooting during windstorms.

The seasonally high water table, slow permeability in the substratum, susceptibility to frost action, low soil strength, and tendency of the soil to slump in exposed cuts are serious limitations for most urban uses of this Raynham soil. Properly designed drains are needed around foundations to minimize the wetness. Because this soil has relatively low strength, buildings can settle unevenly unless proper foundations are installed. The sidewalls of excavations or trenches are quite unstable and tend to slump or erode. Frost action is a threat to roads and to buildings without basements.

This Raynham soil is in capability subclass IIIw.

RaB—Raynham silt loam, 3 to 8 percent slopes. This gently sloping, silty soil is deep and somewhat poorly drained. It is mainly on broad, undulating plains in the lowlands in the northern part of the county and in small pockets on the upland plateau. Areas of this soil are irregular in shape and range from 3 to 50 acres, but most areas are less than 20 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam about 8 inches thick. The subsoil is mottled, yellowish brown silt loam about 18 inches thick. The substratum, to a depth of 42 inches, is mottled, yellowish brown silt loam, and the lower part is grayish brown fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the Minoa and the Collamer soils. The Minoa soils are more sandy than this Raynham soil and the moderately well drained Collamer soils are on slightly convex knolls. Also included are soils that are similar to this Raynham soil but have a dense fragipan in the subsoil. In some areas, particularly in the uplands, the subsoil is more acid than is typical for this Raynham soil. Areas of included soils range from 1/2 acre to 2 acres.

From November through June this Raynham soil has a seasonal high water table in the upper part of the subsoil. Permeability is moderate or moderately slow in the subsoil and slow in the substratum. The available water capacity is high. Internal drainage is slow, and runoff is medium. There is usually no gravel in this soil, and bedrock is more than 5 feet deep. The surface layer and subsoil are strongly acid to neutral.

This soil is moderately suited to farming but poorly suited to most urban uses. Most of the acreage is in hay, pasture, woodland, or it is idle.

The suitability of this Raynham soil for cultivated crops can be improved with drainage. In undrained areas, seasonal wetness delays planting until late spring. Puddling and soil compaction are hazards if the soil is tilled when wet. Erosion is a problem in intensively cultivated areas and where the subsoil is exposed in open ditches. If properly drained, this gravel- and stone-free soil is easy to till and is productive for many crops. Keeping tillage to a minimum, using cover crops, tilling across slopes, and including grasses and legumes in the cropping system help maintain good tilth and control erosion.

Without adequate drainage, this soil is best suited to hay crops or pasture that can withstand seasonal wetness. Overgrazing and grazing when the soil is wet are major concerns of management. Overgrazing can cause the loss of the pasture seeding, and grazing when the soil is wet can cause soil compaction, restricted plant growth, and the loss of the seeding. Proper stocking, rotation of pastures, yearly mowing, and restricted grazing when the soil is wet help keep pastures productive.

The potential of this soil for wood crops is fair. Seasonal wetness increases seedling mortality, limits the use of planting and harvesting equipment, and restricts rooting depth. Because the rooting depth is restricted, trees are more susceptible to uprooting during windstorms.

The seasonally high water table, slow permeability in the substratum, susceptibility to frost action, low strength, and tendency of the soil to slump or erode in exposed cuts are serious limitations for most urban uses of this Raynham soil. Properly designed drains are needed around foundations to minimize the wetness. Interceptor drains in some areas divert runoff and seepage from the higher adjacent soils. Revegetating disturbed areas as soon as possible helps control erosion. Because this soil has relatively low strength, buildings can settle unevenly unless proper foundations are installed. The sidewalls of excavations or trenches are unstable. Frost action is a threat to roads and buildings without basements.

This Raynham soil is in capability subclass IIIw.

Re—Red Hook silt loam. This nearly level soil is deep and somewhat poorly drained. It is on moderately low flats of outwash plains and older stream terraces. Areas of this soil are generally oblong or irregular in shape and range from 5 to over 100 acres, but areas of 30 to 40 acres are most common. Slope ranges from 0 to 3 percent.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 10 inches thick. The subsoil is about 13 inches thick. It is yellowish brown loam in the upper part and brown heavy loam in the lower part. The substratum, to a depth of 45 inches, is dark gray shaly loam, and it is gray stratified shaly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small intermingled areas of the Castile, Rhinebeck, and Halsey soils. The Castile soils are on slight rises and are somewhat better drained than this Red Hook soil. The Rhinebeck soils in scattered areas are underlain by clayey deposits at a depth of less than 20 inches, and the Halsey soils are in low depressions and are more poorly drained than this Red Hook soil. Also included are small spots of a soil that is similar to this Red Hook soil but has stratified sand and gravel within 40 inches of the surface. Areas of included soils make up 10 to 15 percent of the map unit, and they range from 1/2 acre to 3 acres.

This Red Hook soil has a seasonal high water table in the upper part of the subsoil from December through May. Permeability is moderate throughout the soil. The available water capacity is low to moderate, and runoff is slow. Depth to bedrock is generally more than 5 feet. Gravel or shale fragments make up less than 15 percent of the surface layer. Reaction ranges from strongly acid to slightly acid in the surface layer.

Because of seasonal wetness and general low natural fertility, this soil is only moderately suited to farming. It also has limited suitability for many urban uses. Most of the acreage is idle or in pasture or woodland.

The Red Hook soil is poorly suited to cultivated crops, unless drained. If adequate outlets are available, subsurface drains generally function well in this soil. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops improve tilth, help maintain the organic matter content, and improve crop yields. In adequately drained areas, this soil is suited to most crops grown in the county.

In undrained areas, pasture and hay crops can be grown if varieties are used than can withstand seasonal wetness. Restricting grazing when the soil is wet helps prevent soil compaction and trampling of forage plants.

The potential of this soil for wood crops is fair, but only a small acreage is wooded. Machine planting of seedlings is practical in the larger areas, but the seasonal wetness increases seedling mortality and restricts rooting depth. Uprooting of trees during windstorms is also a hazard because of the restricted rooting depth. Seedlings that can withstand seasonal wetness are the most desirable.

The seasonal high water table and high risk of frost damage are serious limitations for many urban uses of this Red Hook soil. If this soil is used for septic tank absorption fields, they should be specially designed to prevent contamination of the ground water. Basements are difficult to keep dry, therefore drains are needed around foundations. In excavations, the subsoil is erosive and cut walls are unstable, especially when the soil is wet. Applications of lime and fertilizer are needed to establish and maintain lawns.

This Red Hook soil is in capability subclass IIIw.

RfA—Remsen silty clay loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in glacial till deposits that have a high clay content. This soil is on almost flat till plains, mostly in the north-central and southwestern parts of the county. Areas of this soil are generally irregular in shape and range from 3 to 200 acres, but most areas are smaller than 100 acres.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 7 inches thick. The subsurface layer is mottled, grayish brown silty clay loam 2 inches thick. The subsoil extends to a depth of 36 inches. It is of mottled, dark grayish brown silty clay in the upper part and mottled, dark grayish brown clay in the lower part. The substratum to a depth of 60 inches or more is dark grayish brown clay.

Included with this soil in mapping are small areas of the Darien, Brockport, Churchville, and Canadice soils. The Darien soils have a slightly lower clay content than this Remsen soil. The Brockport soils are underlain by shale bedrock at a depth of 20 to 40 inches. The Churchville soils have a thin mantle of stone-free glacial lake sediments. The poorly drained Canadice soils are in small depressions. Also included are small areas of the gently sloping Remsen soils. Areas of included soils range up to 3 acres.

From December through May this Remsen soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. Shale fragments can make up as much as 10 percent of the surface layer and subsoil. Depth to bedrock is generally more than 5 feet. Reaction ranges from strongly acid to slightly acid in the surface layer.

Because of seasonal wetness, very slow permeability, poor soil compaction, and clayey texture, this soil is only moderately suitable for many farm and urban uses. Most of the acreage is in hay, pasture, or woodland, or it is idle. A few areas of this soil are in residential development.

Because of seasonal wetness and clayey texture, this Remsen soil is only moderately suitable for cultivated crops. The puddling and clodding of the surface layer is a serious problem if the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system improve tilth, maintain or improve the organic matter content, and increase crop yields. Drainage can be difficult to install because of the very slow permeability, nearly flat slopes, and high clay content of the soil. Drains generally need to be closely spaced to be effective. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for many crops grown in the county, except for early-market and long-season varieties.

Without adequate drainage, this soil can be used for well-managed hay and pasture. Forage grasses that can withstand seasonal wetness are the most suitable. Grazing when the soil is wet is the major concern of management because it causes soil compaction, restricts plant growth, and leads to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crops is fair to good. The hazard of erosion and seedling mortality are generally not problems, but seasonal wetness is a minor limitation to the use of equipment and restricts rooting depth. Uprooting of trees during windstorms is a hazard because of the restricted rooting depth.

The perched seasonally high water table, clayey texture, poor soil compaction, and very slow permeability are serious limitations for most urban uses of this soil. Basements of dwellings are difficult to keep dry. Drains are needed around foundations to reduce wetness. During construction, the disturbed clayey subsoil is difficult to recompact and tends to settle unevenly under a load. Some areas are sites for dugout ponds, but they refill slowly because of the very slow permeability of the soil.

This Remsen soil is in capability subclass IIIw.

RfB—Remsen silty clay loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in glacial till deposits that have a high clay content. This soil is on undulating till plains, mostly in the north-central and southwestern parts of the county. Areas of this soil are generally irregular in shape, but they are elongated when parallel to drainageways. Areas of this soil are 3 to 50 acres, but they range up to more than 100 acres in a few places.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 7 inches thick. The subsurface layer is mottled, grayish brown silty clay loam 2 inches thick. The subsoil extends to a depth of 36 inches. It is mottled, dark grayish brown silty clay in the upper part and mottled, dark grayish brown clay in the lower part. The substratum to a depth of 60 inches or more is dark grayish brown clay.

Included with this soil in mapping are small areas of the Darien, Brockport, Churchville, and Canadice soils. The Darien soils have a slightly lower clay content than this Remsen soil. The Brockport soils are underlain by shale bedrock at a depth of 20 to 40 inches. The Churchville soils have a thin mantle of stone-free, clayey glacial lake sediments. The poorly drained Canadice soils are in small depressions and along drainageways. Also included are small areas of the nearly level and sloping Remsen soils. Areas of included soils range up to 3 acres.

From December through May this Remsen soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is medium. Shale fragments can make up as much as 10 percent of the surface layer and subsoil. Depth to bedrock is generally more than 5 feet. Reaction ranges from strongly acid to slightly acid in the surface layer.

Because of seasonal wetness, very slow permeability, poor soil compaction, and clayey textures, this soil is only moderately suitable for many farm and urban uses. Most of the acreage is farmed, idle, or in woodland. A few areas of this soil are in residential development.

Because of seasonal wetness and clayey textures, this Remsen soil is only moderately suitable for cultivated crops. Erosion is a hazard. Puddling and clodding of the surface layer is a problem if the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, tilling on the contour, and including grasses and legumes in the cropping system improve tilth, control erosion, maintain or improve the organic matter content, and increase crop yields. Drainage can be difficult to install because of the very slow permeability and high clay content of the soil. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for many crops grown in the county, except for early-market and long-season varieties.

Without adequate drainage, this soil can be used for well-managed hay crops and pasture. Forage plants that can withstand seasonal wetness are the most suitable. Grazing when the soil is wet is the major concern of management because it causes soil compaction, restricts growth, and leads to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs. Overgrazed areas are subject to increased erosion.

The potential of this soil for wood crops is fair to good. The hazard of erosion and seedling mortality are generally not problems, but seasonal wetness is a minor limitation to the use of equipment and restricts root development. Uprooting of trees during windstorms is a hazard because of the restricted rooting depth. Plant competiton prevents natural or artificial regeneration of conifers unless the site is intensively prepared and treated—for example, by weeding.

The perched seasonally high water table, clayey texture, poor soil compaction, and very slow permeability are serious limitations for many urban uses of this soil. Basements of dwellings are difficult to keep dry. Drains around foundations and interceptor drains placed upslope from buildings are needed to divert surface runoff and seepage. If the clayey subsoil is disturbed during construction, it is difficult to recompact and tends to settle unevenly under a load. Because erosion is a very serious hazard, construction sites should be revegetated as soon as possible. Some areas are sites for dugout ponds, but they refill slowly because of the very slow permeability of the soil.

This Remsen soil is in capability subclass IIIw.

RfC—Remsen silty clay loam, 8 to 15 percent slopes. This sloping soil is deep and somewhat poorly drained. It formed in glacial till deposits that have a high clay content. This soil is on hillsides and rolling till plains, mostly in the north-central and southwestern parts of the county. Areas of this soil are generally elongated in shape, particularly along dissected drainageways, and they range from 3 to 50 acres.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 7 inches thick. The subsurface layer is mottled, grayish brown silty clay loam 2 inches thick. The subsoil extends to a depth of 36 inches. It is mottled, dark grayish brown silty clay in the upper part and mottled, dark grayish brown clay in the lower part. The substratum to a depth of 60 inches or more is dark grayish brown clay.

Included with this soil in mapping are small areas of the Danley and Churchville soils. The Danley soils have a slightly lower clay content than this Remsen soil and are on convex, better drained knolls. The Churchville soils have a thin mantle of stone-free glacial lake sediments. Also included are small areas of the gently sloping Remsen soils. In some areas included soils are moderately steep, or are severely eroded, or have bedrock within 40 inches of the surface. Areas of included soils range up to 3 acres.

From December through May this Remsen soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is rapid. Shale fragments can make up as much as 10 percent of the surface layer and subsoil. Depth to bedrock is generally more than 5 feet. Reaction ranges from strongly acid to slightly acid in the surface layer.

Because of seasonal wetness, slope, very slow permeability, poor soil compaction, and clayey texture, this soil is only moderately suitable for many farm and urban uses. Most of the acreage is farmed, idle, or in woodland. A few areas of this soil are in residential development.

Because of seasonal wetness and clayey textures, this Remsen soil is only moderately suitable for cultivated crops. Erosion is a severe hazard. Puddling and clodding of the surface layer is a problem if the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, tilling on the contour, stripcropping, and including grasses and legumes in the cropping system improve tilth, control erosion, maintain or improve the organic matter content, and increase crop yields. Interceptor drains and diversion ditches facilitate drainage in some areas. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for some crops grown in the county.

Without adequate drainage, this soil can be used for well-managed hay crops and pasture. Forage plants that can withstand seasonal wetness are the most suitable. Grazing when the soil is wet is the major concern of management because it causes soil compaction, restricts growth, and leads to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs. Overgrazed areas are subject to increased erosion.

The potential of this soil for wood crops is fair to good. Seedling mortality is generally not a problem, but seasonal wetness is a minor limitation to the use of equipment and restricts root penetration. Uprooting of trees during windstorms is a hazard because of the restricted rooting depth. Placing logging trails on the contour reduces the hazard of trail gullying or erosion.

The perched seasonally high water table, slope, clayey texture, poor soil compaction, and very slow permeability are serious limitations for most urban uses of this soil. Basements of dwellings are difficult to keep dry. Drains around foundations and interceptor drains placed upslope from buildings divert surface runoff and seepage. If the clayey subsoil is disturbed during construction, it is difficult to recompact and tends to settle unevenly under a load. Erosion is a very serious hazard where the soil is disturbed and the vegetation is removed. Construction sites should be revegetated as soon as possible to reduce the hazard of erosion.

This Remsen soil is in capability subclass IIIe.

RgA—Rhinebeck silt loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It is on the lowland lake plain and in a few valleys. Areas of this soil are irregular in shape and range from 3 to 200 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of dark grayish brown silt loam about 9 inches thick. The subsoil is about 28 inches thick. It is mottled, light yellowish brown silty clay in the upper part and mottled, brown silty clay in the lower part. The substratum is dark grayish brown silty clay and becomes varved silty clay with increasing depth.

Included with this soil in mapping are small intermingled areas of the Hudson, Churchville, Niagara, and Canadice soils. The moderately well drained Hudson soils are on small knolls or ridges, and the poorly drained Canadice soils are in low depression. The Churchville soils are underlain by gravelly glacial till deposits at a depth of less than 40 inches, and the Niagara soils have a lower clay content in the subsoil than this Rhinebeck soil. Areas of included soils range from 1/2 acre to 3 acres.

A perched seasonal high water table is in the upper part of the subsoil from January through May. Permeability and runoff are slow. The available water capacity is moderate to high. Depth to bedrock is generally 5 feet or more. There is usually no gravel in the soil. The surface layer is strongly acid to neutral.

This soil is only moderately suited to farming and is poorly suited to many urban uses. Most of the acreage is in pasture or woodland. Some areas of this soil are used for hay and cultivated crops.

This Rhinebeck soil is poorly suited to cultivated crops because undrained areas are seasonally wet. Drainage generally requires a system of open ditches combined with subsurface drains that are closely spaced because of the slowly permeable subsoil. Crusting and clodding are serious hazards if the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops help maintain good tilth, improve the organic matter content, and increase crop yields. If properly drained, this gravel-free soil can be productive for many crops grown in the area.

This soil can be used for pasture and hay, but yields are better when it is at least partially drained. In undrained areas, forage plants that can withstand seasonal wetness are the most suitable. Grazing when the soil is wet should be avoided because it causes soil compaction and trampling of the pasture seedings.

The potential of this soil for wood crops is fair. Machine planting of seedlings is practical in large areas when the soil is not wet. Seedling mortality and uprooting of trees during windstorms are generally not problems. Seedlings that can withstand a seasonal high water table are the most suitable.

The seasonal wetness, slow permeability in the subsoil, and high clay content, are serious limitations for many urban uses of this soil. Drains around foundations are needed to reduce the seasonal high water table. Grading of building sites helps eliminate surface wetness and temporary puddles on the surface. The sidewalls of excavations tend to slump or slide, and the clayey soil is difficult to recompact in disturbed areas. This soil tends to shrink and swell, and the possibility of frost-heave is high.

This Rhinebeck soil is in capability subclass IIIw.

RgB—Rhinebeck silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It is mainly on the lowland dissected lake plain and in a few valleys. These areas are irregular in shape and range from 3 to 150 acres, but areas of 5 to 30 acres are most common. In many places, this soil is on shoulder slopes and side slopes of intermittent drainageways, these areas are very long and narrow.

Typically, this soil has a surface layer of dark grayish brown silt loam about 9 inches thick. The subsoil is about 28 inches thick. It is mottled, light yellowish brown silty clay in the upper part and mottled, brown silty clay in the lower part. The substratum is dark grayish brown silty clay and becomes varved with increasing depth.

Included with this soil in mapping are small intermingled areas of the Hudson, Canadice, Churchville, and Niagara soils. The moderately well drained Hudson soils are on small knolls or ridges, and the poorly drained Canadice soils are in low depression and along the bottom of drainageways. The Churchville soils are underlain by gravelly glacial till at a depth of less than 40 inches, and the Niagara soils have a lower clay content in the subsoil than this Rhinebeck soil. Areas of included soils range from 1/2 acre to 3 acres.

This Rhinebeck soil has a perched seasonal high water table in the upper part of the subsoil from January through May. Permeability is slow. The available water capacity is moderate to high, and runoff is medium. Depth to bedrock is generally 5 feet or more. There is usually no gravel in the soil. The surface layer is strongly acid to neutral.

This soil is only moderately suited to farming and is poorly suited to many urban uses (fig. 8). Most areas are pasture or woodland. Some areas are used for hay and cultivated crops.

Unless drained, this seasonally wet Rhinebeck soil is not well suited to cultivated crops. Interceptor drains to divert runoff and seepage from the adjacent higher soils are needed in many areas. Subsurface drains need to be closely spaced to be effective in the slowly permeable subsoil. Crusting and clodding are serious problems if the soil is tilled when wet, and erosion is a hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling on the contour, plowing at the proper soil moisture content, and rotating crops help maintain good tilth, control erosion, improve the organic matter content, and increase crop yields. If properly drained, this gravel-free soil is productive for many crops grown in the area.

This soil can be used for pasture and hay, but yields are better when the soil is at least partially drained. In undrained areas, forage plants that can withstand seasonal wetness are the most suitable. Grazing when the soil is wet should be avoided because it causes soil compaction and trampling of the pasture seeding.

The potential of this soil for wood crops is fair.

Figure 8.—Rhinebeck silt loam, 3 to 8 percent slopes, is moderately suited to some forage crops. Canadice soils are shown in the darker drainageways.

Machine planting of seedlings is practical in large areas when the soil is not wet. Seedlings that can withstand a seasonal high water table are the most suitable. Seedling mortality and uprooting of trees during windstorms are generally not problems. Placing logging trails across the slope reduces any hazard of trail gullying.

The seasonal wetness, slow permeability in the subsoil, and high clay content are serious limitations for many urban uses of this soil. Drains around foundations minimize the problems associated with the seasonal high water table. Interceptor drains divert runoff and seepage from the adjacent higher soils. Grading building sites helps eliminate surface wetness and temporary puddles. The sidewalls of excavations tend to slump or slide, and the clayey subsoil is difficult to recompact where disturbed. During construction, the disturbed soil should be revegetated as soon as possible to reduce the hazard of erosion. This soil tends to shrink and swell, and the possibility of frost-heave is high.

This Rhinebeck soil is in capability subclass IIIw.

RhC3—Rhinebeck silty clay loam, 8 to 15 percent slopes, severely eroded. This sloping soil is deep and somewhat poorly drained. It is on lower valley sides. This soil is formed in clayey lake-laid sediments. These areas are oblong and range from 3 to 50 acres, but areas of 5 to 20 acres are most common. In most places, the subsoil has been mixed with the surface layer because of excessive erosion. Rills and gullies are common in some areas.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 9 inches thick. The subsoil is about 28 inches thick. It is mottled, light yellowish brown silty clay in the upper part and mottled, brown silty clay in the lower part. The substratum is dark grayish brown silty clay and becomes varved with increasing depth.

Included with this soil in mapping are small intermingled areas of the Hudson, Collamer, and Varysburg soils. The moderately well drained Hudson soils are on small knolls or ridges. The Collamer soils are dominantly silty, and the Varysburg soils have a gravelly surface layer. A few areas of these soils are very severely eroded, and some areas are uneroded. Areas of included soils range from 1/4 acre to 3 acres.

This Rhinebeck soil has a perched seasonal high water table in the upper part of the subsoil from January through May. Permeability is slow. The available water capacity is moderate, and runoff is rapid. Depth to bedrock is generally 5 feet or more. There is usually no gravel in the soil. The surface layer is strongly acid to neutral.

This soil has limitations for farming and is poorly suited to most urban uses. Most of the acreage is pasture or woodland. Some areas of this soil are used for hay and cultivated crops.

This Rhinebeck soil is poorly suited to cultivated crops unless drained and protected from erosion. Drainage is generally by a system of open ditches or diversion ditches combined with closely spaced subsurface drains. So much of the surface layer has eroded away and been replaced with clayey subsoil low in organic matter, that tilth is poor. Crusting and clodding are common if the soil is tilled when wet. Erosion is very serious in cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, adding animal manures, plowing at the proper soil moisture content, and frequently including sod crops in the cropping system improve the organic matter content and tilth of the soil. These practices, plus contour tillage and stripcropping, help control the erosion. Some areas are difficult to till because they include rills and gullies formed by past erosion.

This soil can be used for pasture and hay and is better suited to these uses than to cultivated crops. In undrained areas, forage plants that can withstand seasonal wetness are the most desirable. Grazing when the soil is wet should be avoided, because it causes soil compaction and trampling of the pasture seeding. Overgrazing and grazing when the soil is wet reduce growth of the forage plants and can lead to further erosion.

The potential of this soil for wood crops is fair. Machine planting of seedlings is practical in large areas when the soil is not wet. Placing logging trails on the contour reduces trail gullying and erosion. Clear cutting, however, increases the hazard of erosion. Seedlings that can withstand a seasonal high water table are the most suitable.

The seasonal wetness, slow permeability in the subsoil, slope, high clay content, and severe erosion are limitations for most urban uses of this soil. Interceptor drains placed upslope from buildings are needed to divert surface runoff and seepage and to reduce the wetness. Removing vegetation during construction can lead to excessive erosion on this already severely eroded soil. Revegetating disturbed areas quickly or using some other means of soil protection is essential during construction. The sidewalls of excavations tend to slump or slide, and the clayey soil is difficult to recompact in disturbed areas. Excavations on foot slopes are hazardous because of the danger of mass slumps or slides. Increasing the organic matter content and fertilizing are important to establish and maintain good quality lawns.

This Rhinebeck soil is in capability subclass IVe.

RkA—Rhinebeck gravelly loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in clayey lake-laid sediments mantled with gravelly outwash deposits. This soil is on low terraces on the lowland lake plain. Areas of this soil are irregular in shape and range from 3 to 100 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 9 inches thick. The subsoil is about 28 inches thick. It is light yellowish brown silty clay in the upper part and brown silty clay in the lower part. The substratum is dark grayish brown varved silty clay.

Included with this soil in mapping are small intermingled areas of the Varysburg and Red Hook soils. The well drained and moderately well drained Varysburg soils are on slight rises and small knolls. They are capped by gravelly layers 20 to 40 inches thick. The Red Hook soils do not have a clayey subsoil and substratum. Also included in mapping are areas of poorly drained Canadice soils in depressions and along some drainageways, Rhinebeck soils that do not have gravel in the surface layer, and a few areas of a soil that has gravelly loam in the upper part of the subsoil. Areas of included soils range up to 3 acres.

From January through May this Rhinebeck soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. The available water capacity is moderate to high. Gravel makes up 15 to 25 percent of the surface layer. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and upper part of the subsoil range from strongly acid to neutral.

Because of seasonal wetness, this soil has limited suitability for farming and has serious limitations for most urban uses. Most of the acreage is in pasture or woodland. Some drained areas of this soil are farmed, and a few areas are urbanized.

This Rhinebeck soil is poorly suited to cultivated crops, unless drained. If properly drained by a combination of surface ditches and subsurface drains, this soil is suited to most crops grown in the county. Subsurface drains usually need to be closely spaced to be effective, and tile drains that are backfilled with gravel are most efficient. Cobblestones and gravel are problems in cultivating some crops and cause excessive wear of machinery. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth and increase the organic matter content of the soil. Good tilth leads to improved drainage and good aeration, which allow for better root development.

This Rhinebeck soil has limited suitability for hay and pasture. If it is partially drained, forage yields improve. Overgrazing and grazing when the soil is wet are the chief management concerns. Overgrazing restricts plant growth, and grazing when the soil is wet can cause loss of the pasture seeding through soil compaction and trampling. Plant varieties that can withstand seasonal wetness are the most suitable.

This soil has fair potential for wood crops. Seasonal wetness limits the use of planting and harvesting equipment. Seedlings that can withstand the seasonal high water table have a low mortality rate and are the most desirable for rapid growth.

The seasonal wetness, slow permeability in the subsoil, relatively low soil strength, clayey subsoil texture, gravel in the surface layer, and high risk of frost damage are serious limitations for most urban and recreational uses of this soil. In excavated areas, this soil is difficult to recompact and regrade because of its high clay content. Sidewalls of excavations tend to be unstable and slump or slide. In disturbed areas, this soil can be erosive, especially when the gravelly loam surface mantle is removed. The upper gravelly mantle is not a good source of sand and gravel because the layer is too thin.

This Rhinebeck soil is in capability subclass IIIw.

RkB—Rhinebeck gravelly loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in clayey lake-laid sediments mantled with gravelly outwash deposits. This soil is on toe slopes or low terraces along valley floors, mostly in the southern part of the county. Many areas receive runoff or seepage from the higher adjacent soils. Areas of this soil are irregular in shape and range from 3 to 100 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 9 inches thick. The subsoil is about 28 inches thick. It is light yellowish brown silty clay in the upper part and brown silty clay in the lower part. The substratum is dark grayish brown varved silty clay.

Included with this soil in mapping are small intermingled areas of the Varysburg and Red Hook soils. The well drained and moderately well drained Varysburg soils are on slight rises and small knolls. They are capped by gravelly layers 20 to 40 inches thick. The Red Hook soils do not have a clayey subsoil and substratum. Also included in mapping are areas of poorly drained Canadice soils along some drainageways, Rhinebeck soils that do not have gravel in the surface layer, and a few areas of a soil that has gravelly loam in the upper part of the subsoil. Areas of included soils range up to 3 acres.

From January through May this Rhinebeck soil has a perched seasonal high water table in the upper part of the subsoil. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is medium. Gravel makes up 15 to 25 percent of the surface layer. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and upper part of the subsoil range from strongly acid to neutral.

Because of seasonal wetness, this soil has limited suitability for farming and serious limitations for most urban uses. Most of the acreage is in pasture or hay. Some drained areas of this soil are in cultivated crops, and a few areas are urbanized.

This Rhinebeck soil is poorly suited to cultivated crops, unless drained. If properly drained by a combination of surface ditches and subsurface interceptor drains, this soil is suited to many crops grown in the county. Subsurface drains generally need to be closely spaced to be effective, and tile drains backfilled with gravel are the most efficient. Cobblestones and gravel are problems in cultivating some crops and cause excessive wear of machinery. Erosion is a hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth, control erosion, and increase the organic matter content of the soil. Good tilth leads to improved drainage and better soil aeration, which allow for better root development.

This Rhinebeck soil has limited suitability for hay and pasture. If it is partially drained, forage production is improved. Overgrazing and grazing when the soil is wet are the chief management concerns. Overgrazing restricts plant growth, and grazing when the soil is wet can cause the loss of the pasture seeding through soil compaction and trampling. Plant varieties that can withstand seasonal wetness are the most desirable.

This soil has fair potential for wood crops. Seasonal wetness limits the use of planting and harvesting equipment. Seedlings that can withstand the seasonal high water table have a low mortality rate and are the most suitable for rapid growth.

The seasonal wetness, slow permeability in the subsoil, relatively low soil strength, clayey subsoil texture, gravel in the surface layer, and high risk of frost damage are serious limitations for most urban and recreational uses of this soil. In excavated areas, this soil is difficult to recompact and regrade because of its high clay content. Excavated areas are also subject to severe erosion. Sidewalls of excavations tend to be unstable and can slump or slide. The upper gravelly mantle is not a good source of sand and gravel because the layer is too thin.

This Rhinebeck soil is in capability subclass IIIw.

RmA—Rhinebeck silty clay loam, stratified substratum, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It is near remnant glacial lake beaches. This soil formed in clayey lake sediments underlain by stratified shaly deposits at a depth of 3 to 7 feet. Areas of this soil are irregular in shape and range from 3 to 100 acres.

Typically, this soil has a surface layer of dark grayish brown silty clay loam 8 inches thick. The subsoil is 30 inches thick. It is mottled, light yellowish brown silty clay in the upper part and mottled, brown silty clay in the lower part. The substratum is dark grayish brown silty clay in the upper part; is stratified olive gray shaly loamy sand in the middle part; and is firm, olive brown shaly loam below a depth of 60 inches.

Included with this soil in mapping are small intermingled areas of the Remsen and Churchville soils. The Remsen soils formed in clayey glacial till deposits. The Churchville soils are underlain by gravelly glacial till deposits at a depth of less than 40 inches. Also included are some areas where the subsoil is silt loam and sandy clay loam and a few areas of a gently sloping soil. Areas of included soils range from 1/4 acre to 3 acres.

This Rhinebeck soil has a perched seasonal high water table in the upper part of the subsoil from January through May. Permeability and runoff are slow. The available water capacity is moderate to high. Depth to bedrock is generally 5 feet or more. There is generally no gravel in the surface layer and subsoil, but it ranges up to 35 percent in the shaly substratum.

This soil is only moderately suited to farming and is poorly suited to many urban uses. Most of the acreage is farmed, in woodland, or is idle.

Unless drained, this soil is not well suited to cultivated crops because of seasonal wetness. A system of open ditches combined with closely spaced subsurface drains is usually effective in the slowly permeable subsoil. Crusting and clodding of the surface layer are serious problems if the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling on the contour, plowing at the proper soil moisture content, and rotating crops help maintain good tilth, improve the organic matter content, and increase crop yields. If properly drained, this soil is productive for many crops grown in the area.

This soil can be used for pasture and hay, but forage yields are better when the soil is at least partially drained. In undrained areas, forage plants that can withstand seasonal wetness are the most suitable. Grazing when the soil is wet should be avoided, because it causes soil compaction and trampling of the pasture seeding.

The potential of this soil for wood crops is fair. Machine planting of seedlings is practical in large areas, but seasonal wetness can delay equipment use in the spring. Seedling mortality and uprooting of trees during windstorms are generally not problems. Seedlings that can withstand a seasonal high water table are the most suitable.

The seasonal high water table, slow permeability in the subsoil, high clay content, water-bearing substratum, and instability of cut banks are serious limitations for most urban uses of this soil. Drains around foundations are needed to minimize wetness. Because of the shaly water-bearing substratum, the sides of excavations and ditches are extremely unstable and subject to slumping. The clayey subsoil is very difficult to recompact when disturbed and can settle unevenly under loads. This soil tends to shrink and swell upon wetting and drying, and the frost-heave potential is high.

This Rhinebeck soil is in capability subclass IIIw.

RmB—Rhinebeck silty clay loam, stratified substratum, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It is near remnant glacial beach ridges. This soil formed in clayey lake-laid sediments underlain by stratified shaly deposits at a depth of 3 to 7 feet. Areas of this soil are irregular in shape and range from 3 to 50 acres.

Typically, this soil has a surface layer of dark grayish brown silty clay loam about 8 inches thick. The subsoil is about 30 inches thick. It is mottled, light yellowish brown silty clay in the upper part and mottled, brown silty clay in the lower part. The substratum is dark grayish brown silty clay in the upper part; is stratified olive gray shaly loamy sand in the middle part; and is firm, olive brown shaly loam below a depth of 60 inches.

Included with this soil in mapping are small intermingled areas of the Remsen and Churchville soils. The Remsen soils formed in glacial till deposits. The Churchville soils are underlain by gravelly glacial till deposits at a depth of less than 40 inches. Also included are some areas where the subsoil is silt and sandy clay loam and a few areas of a nearly level soil. Areas of included soils range from 1/4 acre to 3 acres.

This Rhinebeck soil has a perched seasonal high water table in the upper part of the subsoil from January through May. Permeability is slow in the subsoil. The available water capacity is moderate to high, and runoff is medium. Depth to bedrock is generally 5 feet or more. There is generally no gravel in the surface layer and subsoil, but it ranges up to 35 percent in the shaly substratum. The stratified shaly substratum is saturated much of the year. The surface layer is strongly acid to neutral.

This soil is only moderately suited to farming and is poorly suited to many urban uses. Most of the acreage is in pasture, hay, or woodland. Some areas of this soil are used for cultivated crops or are idle.

Unless drained, this soil is not well suited to cultivated crops because of seasonal wetness. Interceptor drains that divert runoff and seepage from the adjacent higher soils are needed in many areas. Sidewalls of ditches can be unstable because of the water-bearing shaly substratum. Subsurface drains need to be closely spaced to be effective in the slowly permeable subsoil. Crusting and clodding are very serious problems if the soil is tilled when wet. Erosion is a hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling on the contour, plowing at the proper soil moisture content, and rotating crops help maintain good tilth, control erosion, improve the organic matter content, and increase crop yields. This gently sloping soil can be productive for many crops grown in the area and is easier to drain than the nearly level Rhinebeck soil.

This soil can be used for pasture and hay, but yields are better when the soil is at least partially drained. In undrained areas, forage plants that can withstand seasonal wetness are the most suitable. Grazing when the soil is wet should be avoided, because it causes soil compaction and trampling of the pasture.

The potential of this soil for wood crops is fair. Machine planting of seedlings is practical on large areas, but spring wetness can interfere with equipment use. Seedling mortality and uprooting of trees during windstorms are generally not problems. Seedlings that can withstand a seasonal high water table are the most suitable. Placing logging trails across the slope minimizes trail gullying.

The seasonal wetness, slow permeability in the subsoil, water-bearing substratum, high clay content, and instability of cut banks are serious limitations for most urban uses of this soil. Drains around foundations are needed to minimize wetness caused by the seasonal high water table. Interceptor drains divert runoff and seepage from the adjacent higher soils. Sidewalls of excavations in the water-bearing shaly substratum tend to be unstable and are subject to slumping. Soil disturbed by construction should be revegetated as soon as possible because of the severe hazard of erosion. This soil tends to shrink and swell upon wetting and drying, and the frost-heave potential is high.

This Rhinebeck soil is in capability subclass IIIw.

Ro—Rock outcrop. This map unit is mainly outcrops of shale bedrock. These areas are mostly on dissected, very steep valley walls, vertical cliffs, and shale bedrock escarpments. Most areas of Rock outcrop occur as elongated, narrow strips and range from 3 to 200 acres. Slope ranges from 40 to 80 percent.

Included with this miscellaneous unit in mapping are small intermingled areas of colluvial, or talus, material at the base of slopes. Large areas of the moderately deep Manlius soils are included in mapping. Also included are large areas of soils that are 0 to 20 inches deep to bedrock. Areas of included soils make up about 25 percent of the map unit and range up to 3 acres.

Most of the acreage of the exposed bedrock is bare of vegetation. Some small trees and plants are in crevises of the rock. This unit is not suited to farm, urban, or recreational uses because of exposed bedrock and very steep slopes. Some areas are excellent sites for viewing geologic strata, and other areas are scenic overlooks.

Rock outcrop is in capability subclass VIIIs.

SaA—Schoharie silt loam, 0 to 3 percent slopes. This nearly level soil is deep and well drained to moderately well drained. It formed in reddish glacial lake sediments that are high in clay. This soil is on the slightly convex, higher parts of the lake plain, mostly in the northern part of the county. Most areas are moderately well drained; only a few areas are well drained. Areas of this soil are large and irregular in shape and range from 3 to 200 acres or more, but areas of 5 to 60 acres are most common.

Typically, this soil has a surface layer of dark brown silt loam 9 inches thick. The subsoil extends to a depth of 31 inches. It is brown silty clay loam in the upper part; reddish brown silty clay in the middle; and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is reddish brown silty clay and clay varved with silt.

Included with this soil in mapping are small intermingled areas of the Odessa, Lakemont, Niagara, and Hudson soils. The somewhat poorly drained Odessa soils are along drainageways, on foot slopes, and on nearly level spots. The Lakemont soils are poorly drained or very poorly drained and are in small depressions and along deeply dissected drainageways. The Niagara soils are in scattered areas and are more silty and less clayey than this Schoharie soil. The Hudson soils are not as red as this Schoharie soil. Also included are soils that formed in loamy glacial till deposits 3 to 5 feet thick. Areas of included soils range up to 3 acres.

From March through May this Schoharie soil has a perched seasonal high water table that rises into the lower part of the subsoil. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow to medium. There is generally no gravel in the soil. Bedrock is at a depth of 5 feet or more. Unless limed, reaction is medium acid to neutral in the surface layer.

This soil is moderately suited to farming but has limitations for urban uses. Most of the acreage is in urban development or is farmed. Some areas of this soil are idle.

This Schoharie soil is moderately suited to cultivated crops. Temporary wetness in the spring can slightly delay normal tillage. Puddling and crusting of the surface layer are likely, particularly if the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, plowing at the proper soil moisture content, and rotating crops help maintain tilth, improve the organic matter content, and increase crop yields. The efficiency of many fields is improved by subsurface drainage of included wet spots.

This soil is also suited to hay and pasture. Grazing when the soil is wet causes soil compaction and puddling and restricts forage growth. Overgrazing can lead to the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crops is good. Uprooting of trees during windstorms, erosion hazard, equipment limitations, and seedling mortality are generally not problems on this soil. Large areas are suited to mechanical planting of seedlings.

The temporary seasonal wetness, low soil strength, poor soil compaction, clayey texture, and slow or very slow permeability are serious limitations for many urban uses of this soil. Subsurface drains around foundations are needed to minimize the wetness. Disturbance of the clayey subsoil during constuction makes it difficult to recompact and can result in uneven settling under a load. The clayey subsoil is erosive, unstable, and difficult to revegetate where exposed or disturbed. Some areas are adequate sites for recreational uses, such as picnic areas and campsites.

This Schoharie soil is in capability subclass IIw.

SaB—Schoharie silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained to moderately well drained. It formed in reddish glacial lake sediments that are high in clay. This soil is on convex parts of shoulder slopes that parallel dissected drainageways on the lowland lake plain. It is also on convex knolls and ridges. Areas of this soil are large and irregular in shape and range from 3 to 200 acres or more, but areas of 5 to 75 acres are most common.

Typically, this soil has a surface layer of dark brown silt loam 9 inches thick. The subsoil extends to a depth of 31 inches. It is brown silty clay loam in the upper part; reddish brown silty clay in the middle; and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is reddish brown silty clay and clay varved with silt.

Included with this soil in mapping are small intermingled areas of the Odessa, Lakemont, Niagara, and Collamer soils. The somewhat poorly drained Odessa soils are along drainageways, on foot slopes, and in nearly level spots. The Lakemont soils are poorly drained and are in small depressions and along deeply dissected drainageways. The Niagara and Collamer soils are in scattered areas and are more silty and less clayey than this Schoharie soil. Also included are some soils that formed in loamy glacial till deposits 3 to 5 feet thick. Areas of included soils range up to 3 acres.

From March through May this Schoharie soil has a perched seasonal high water table that rises into the lower part of the subsoil. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is medium. There is generally no gravel in the soil. Bedrock is at a depth of 5 feet or more. Unless limed, the soil is medium acid to neutral in the surface layer.

This soil is moderately suited to farming, but has limitations for urban uses. Current land use includes urban development and farming, and some areas of this soil are idle.

This Schoharie soil is moderately suited to cultivated crops. Sheet erosion and gullying are serious hazards in intensively cultivated areas. Puddling and crusting of the surface layer are likely, particularly if the soil is tilled when wet. Temporary wetness in the spring can delay normal tillage. Keeping tillage to a minimum, using cover crops, tilling across slopes, and rotating crops improve tilth, help maintain the organic matter content, and control erosion. The efficiency of many fields is improved by subsurface drainage of included wet spots.

This soil is suited to hay and pasture. Grazing when the soil is wet causes soil compaction and puddling and restricts forage growth. Overgrazing can lead to the eventual loss of the pasture seeding and can increase the erosion hazard. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crops is good. Uprooting of trees during windstorms, erosion hazard, equipment limitations, and seedling mortality are generally not problems on this soil. Placing logging trails across the slope reduces the hazard of trail gullying.

The temporary seasonal wetness, low soil strength, poor soil compaction, clayey texture, and slow or very slow permeability are serious limitations for many urban uses of this soil. Subsurface drains around foundations are needed to minimize wetness. Interceptor drains placed upslope from buildings divert surface runoff and seepage and also minimize the wetness. Disturbance of the clayey subsoil during construction makes it difficult to recompact and can cause it to settle unevenly under a load. The clayey subsoil is erosive, unstable, and difficult to revegetate when exposed or disturbed. Some areas are adequate sites for recreational uses, such as picnic areas and campsites.

This Schoharie soil is in capability subclass IIe.

SbC3—Schoharie silty clay loam, 8 to 15 percent slopes, severely eroded. This sloping soil is deep and well drained to moderately well drained. It formed in reddish glacial lake sediments that are high in clay. This soil is on convex side of dissected drainageways on the lake plain. Much of the original surface layer has been mixed with the subsoil by erosion. In many places rills and small gullies are common. Areas of this soil are mostly elongated and range from 3 to 75 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of brown silty clay loam 9 inches thick. The subsoil extends to a depth of 31 inches. It is brown silty clay loam in the upper part; reddish brown silty clay in the middle; and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is reddish brown silty clay and clay varved with silt.

Included with this soil in mapping are small intermingled areas of the Odessa, Hudson, Cayuga, and Collamer soils. The somewhat poorly drained Odessa soils are along drainageways and on some foot slopes. The Hudson soils are gray and do not have the red color of this Schoharie soil. The Cayuga soils have loamy glacial till within 40 inches of the surface. The Collamer soils are in scattered areas and are more silty and less clayey than this Schoharie soil. Also included are a few areas of soils that are moderately steep. Areas of included soils range from 1/4 acre to 3 acres.

From March through May this Schoharie soil has a perched seasonal high water table in the lower part of the subsoil. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is rapid. There is usually no gravel in the soil. Bedrock is at a depth of 5 feet or more. Unless limed, the soil is medium acid to neutral in the surface layer.

This soil is poorly suited to most farm and urban uses. Most of the acreage is idle, but some areas of this soil are farmed or in urban development.

This Schoharie soil is poorly suited to cultivated crops. Sheet erosion and gullying have removed much of the original surface layer, and continuous cultivation has mixed some of the clayey subsoil into it. Further erosion is a very serious hazard. The surface layer puddles and crusts in cultivated areas, particularly if the soil is tilled when wet. Temporary wetness in the spring slightly delays normal tillage operations. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, and frequently including sod crops in the cropping system improve tilth and the organic matter content of the soil. These practices, plus cross-slope tillage and terracing, help control erosion. The efficiency of some fields is improved by subsurface drainage of included wet spots.

In many areas, this soil is better suited to hay or pasture than to cultivated crops. Grazing when the soil is wet causes soil compaction and puddling and restricts forage growth. Overgrazing can reduce plant growth and increase the erosion hazard. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential productivity of this soil for wood crops is good. Uprooting of trees during windstorms, equipment limitations, and seedling mortality are generally not problems. Placing logging trails across the slope reduces the hazard of trail gullying and erosion, but clear-cutting increases the hazard of erosion.

The temporary seasonal wetness, low soil strength, slope, poor soil compaction, clayey texture, and slow or very slow permeability are very severe limitations for many urban uses of this soil. Subsurface drains around foundations are needed to reduce wetness. Interceptor drains placed upslope from buildings divert surface runoff and seepage and also minimize wetness. If the clayey subsoil is disturbed during construction, it is difficult to recompact and can settle unevenly under a load. The clayey subsoil is erosive and unstable, and it tends to slump or slide in excavations on foot slopes. Establishing lawns or revegetating areas can be somewhat difficult because of the low organic matter content and poor tilth of the soil.

This Schoharie soil is in capability subclass IVe.

ScD—Schuyler silt loam, 15 to 25 percent slopes. This moderately steep soil is moderately well drained. It formed in glacial till deposits on valley sides and hillsides. Slopes are generally smooth, convex, and long. Areas of this soil are mostly elongated. They range from 3 to 200 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 6 inches thick. The subsoil extends to a depth of 42 inches. It is dark yellowish brown silt loam and yellowish brown heavy silt loam in the upper part and is mottled, light olive brown shaly silt loam and olive shaly heavy silt loam in the lower part. The substratum is olive very shaly heavy silt loam interbedded with light olive gray and strong brown shale. Soft shale bedrock is at a depth of 48 inches.

Included with this soil in mapping are small intermingled areas of the Orpark, Hornell, Derb, and Marilla soils. The Orpark soils are underlain by bedrock at a depth of 20 to 40 inches. The Hornell soils have a clayey subsoil and are somewhat poorly drained. The Derb soils are on foot slopes and along drainageways, and the Marilla soils have a fragipan in the subsoil. The Derb and Marilla soils generally are less sloping than this Schuyler soil. Areas of included soils range up to 3 acres.

This Schuyler soil has a perched seasonal high water table in the lower part of the subsoil from March through May. Permeability is moderate in the surface layer, moderate or moderately slow in the subsoil, and moderately slow or slow in the substratum. The available water capacity is moderate to high, and runoff is rapid. Bedrock is at a depth of 48 to 60 inches. Shale fragments make up 5 to 15 percent of the surface layer. In unlimed areas, the surface layer and subsoil are extremely acid to medium acid.

Because of temporary seasonal wetness and erodibility, this soil is poorly suited to most farm and urban uses. Most of the acreage is wooded and is used as wildlife habitat.

This Schuyler soil is poorly suited to cultivated crops because of the moderately steep slopes and high risk of erosion. Stringent management is necessary to prevent erosion, especially in exposed areas. Controlling surface runoff and erosion is essential on this soil to protect adjacent farmland.

This soil has limited suitability for pasture and hay. The moderately steep slopes make the use of equipment difficult. Pastures should not be overgrazed because this can lead to erosion and gullying. Restricting grazing when the soil is wet helps prevent soil compaction and trampling of pasture plants that can lead to the loss of the pasture seeding. Liberal applications of lime are needed to improve the native pasture.

The potential of this soil for wood crops is fair. Most of the acreage is wooded. Equipment should be used with extreme caution on these moderately steep slopes. Placing logging trails across the slope reduces trail gullying and erosion. Seedlings that are suited to acid soils are the most desirable.

Slope, seasonal wetness, moderately slow or slow permeability and high risk of frost damage are serious limitations for most urban uses of this soil. This soil is subject to serious erosion if vegetative cover is removed during construction. Once the subsoil is exposed, it is difficult to revegetate. Some areas of this soil are suitable for certain recreational uses, such as ski slopes.

This Schuyler soil is in capability subclass IVe.

ScE—Schuyler silt loam, 25 to 40 percent slopes. This steep soil is deep and moderately well drained. It formed in glacial till deposits on dissected valley sides and hillsides. Slopes are generally smooth and long. Bedrock is generally at a depth of 4 to 5 feet. Areas of this soil are mostly elongated and range from 3 to 150 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 6 inches thick. The subsoil extends to a depth of 42 inches. It is dark yellowish brown and yellowish brown silt loam in the upper part and mottled, light olive brown and olive shaly silt loam in the lower part. The substratum is very shaly heavy silt loam interbedded with soft shale bedrock. Soft shale bedrock is at a depth of 48 inches.

Included with this soil in mapping are small intermingled areas of the Orpark, Hornell, Derb, and Marilla soils. The somewhat poorly drained Orpark soils are underlain by bedrock at a depth of 20 to 40 inches. The Hornell soils have a higher clay content in the subsoil than this Schuyler soil. The Derb soils are on foot slopes and along drainageways, and the Marilla soils have a fragipan in the subsoil. These Derb and Marilla soils generally are less sloping than the Schuyler soil. Also included are a few areas of soils that are underlain by bedrock at a depth of less than 4 feet. Areas of included soils range up to 3 acres.

This Schuyler soil has a perched seasonal high water table in the lower part of the subsoil from March through May. Permeability is moderate in the surface layer, moderate or moderately slow in the subsoil, and moderately slow or slow in the substratum. The available water capacity is moderate to high, and runoff is very rapid. Bedrock is at a depth of 48 to 60 inches. Shale fragments make up 5 to 15 percent of the surface layer. In unlimed areas, the surface layer and subsoil are extremely acid to medium acid.

Because of the steep slopes, this soil is not suited to most farm and urban uses. Most of the acreage is wooded and serves as wildlife habitat.

This Schuyler soil is not suited to cultivated crops and hay because of the steep slopes and the associated very serious erosion hazard. The operation of farm equipment is very difficult because of the slope. Maintaining vegetative cover to control surface runoff and erosion is essential to protect adjacent farmland.

This soil has limited suitability for pasture. Reseeding pastures and applying fertilizers is difficult because of the slope. Overgrazing can result in serious erosion and gullying of the soil. Restricting grazing when the soil is wet helps prevent soil compaction and trampling of pasture plants and can lead to the loss of the pasture seeding. Liberal applications of lime are needed to improve the native pasture.

The potential of this soil for wood crops is fair. Most of the acreage is wooded. Extreme caution is required in the use of equipment because of the steep slopes. Clear cutting can lead to very serious erosion. Placing logging trails across the slope reduces trail gullying and erosion. Seedlings that are suited to acid conditions are the most desirable.

Steep slopes, seasonal wetness, moderately slow or slow permeability, and high risk of frost damage are very serious limitations for most urban uses of this soil. This soil is subject to serious erosion if vegetative cover is removed during construction. Once the subsoil is exposed, it is difficult to revegetate. Some areas of this soil are suitable for certain recreational uses, such as ski slopes.

This Schuyler soil is in capability subclass VIe.

Sd—Scio silt loam. This nearly level soil is deep and moderately well drained. It formed in water- or wind-deposited material on terraces above flood plains of large creeks. This soil is dominantly silt and very fine sand. Areas of this soil are generally oblong or irregular in shape and range from 3 to 40 acres, but areas of 5 to 20 acres are most common. Slope ranges from 0 to 3 percent.

Typically, this soil has a surface layer of dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 34 inches. It is yellowish brown silt loam in the upper part; mottled, dark yellowish brown silt loam in the middle part; and mottled, brown silt loam in the lower part. The substratum is mottled, brown silt loam in the upper part; mottled, brown gravelly sandy loam in the middle part; and mottled, dark brown gravelly loamy sand to a depth of 60 inches.

Included with this soil in mapping are small intermingled areas of the Allard, Raynham, and Collamer soils. The Allard soils are well drained and are slightly higher than this Scio soil. The Raynham soils are somewhat poorly drained and are in slight depressions and along drainageways. The Collamer soils have more clay in the subsoil than this Scio soil. Also included are areas of a soil that is similar to the Scio soil but better drained. Areas of included soils range from 1/2 acre to 3 acres.

From March through May this Scio soil has a seasonal high water table in the lower part of the subsoil. Permeability is moderate in the upper 40 inches and moderately rapid to rapid below 40 inches. The available water capacity is high, and internal drainage and runoff are slow to medium. Depth to bedrock is generally more than 5 feet. In unlimed areas, the surface layer and subsoil range from very strongly acid to medium acid.

This soil is well suited to farming. Most of the acreage is in field crops or specialized crops. This soil has some limitations for urban uses, although a few areas are used for this purpose.

This Scio soil is suited to cultivated crops and vegetable crops. The temporary seasonal high water table can delay tillage and planting in the spring. Drainage of wetter included soils makes for more efficient use of many fields. Keeping tillage to a minimum, liberally applying lime to the soil, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops help maintain good tilth, increase the organic matter content, and provide a better environment for root development. This gravel-free soil is easy to till and is well suited to specialized crops that require irrigation.

Hay crops and pasture also do well on this soil. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the main management needs. Grazing when the soil is wet causes soil compaction and trampling of pasture plants and can lead to the loss of the pasture seeding. Pasture grasses respond well to liberal applications of lime.

The potential of this soil for wood crops is good. Only a small acreage is wooded. Machine planting of seedlings is practical in large areas of this soil. Seedlings that can withstand acid conditions are best suited.

The temporary seasonal wetness and seepage are limitations for some urban uses of this soil. Where the soil is used for septic tank absorption fields, contamination of ground water is a hazard because the substratum is rapidly permeable. Erosion is a moderate hazard when vegetation is removed during construction. Vegetative cover should be replaced as soon as possible to minimize this problem. Sidewalls of excavations tend to be unstable, particularly when the soil is wet. In a few areas, rare flooding from adjacent streams is a hazard. This soil is suited to some recreational uses that require a nearly level, stone-free site.

This Scio soil is in capability subclass IIw.

Sw—Swormville clay loam. This level or nearly level soil is deep and somewhat poorly drained. It is on the lowland plain mainly in the extreme northern part of the county, but it also is in small, isolated pockets elsewhere. Areas of this soil are irregular in shape but are roughly elongated when they parallel streams. Slope is 0 to 2 percent. These areas range from 3 to 200 acres or more, but areas of 5 to 40 acres are most common.

Typically, this soil has a surface layer of dark grayish brown clay loam about 8 inches thick. The subsoil, about 18 inches thick, is mottled, yellowish brown clay loam in the upper part; mottled, yellowish brown loam in the middle part; and mottled, light yellowish brown loamy fine sand in the lower part. The substratum is gray sand below a depth of about 26 inches.

Included with this soil in mapping are small areas of the Getzville, Minoa, and Raynham soils. The poorly drained and very poorly drained Getzville soils are in depressions and along drainageways. The Minoa soils are more sandy in the surface mantle than this Swormville soil. The Raynham soils are very silty. Also included are some larger areas of the Rhinebeck soils that are underlain by sand at a depth of 40 inches or more. Areas of included soils range from 1/4 acre to 2 acres.

From November through May this Swormville soil has a seasonal high water table in the upper part of the subsoil. Permeability is moderately slow in the surface layer, slow or moderately slow in the upper part of the subsoil, and moderately rapid in the lower part of the subsoil and in the substratum. The available water capacity is moderate, and runoff is slow. Bedrock is generally many feet deep. There is generally no gravel in the surface layer and upper part of the subsoil. Reaction in the surface layer is strongly acid to neutral.

This soil can be used for farming but is poorly suited to urban uses. Most of the acreage is farmed, or it is idle. Some areas are in woodland, and a few areas are used for residential purposes.

Because of seasonal wetness, this Swormville soil has limited suitability for cultivated crops, unless drained. Erosion is not a hazard except along open ditches when the sandy substratum is exposed. Ditchbanks that are not vegetated are also subject to slumping and piping. Crusting and compaction of the surface layer is a problem when the soil is tilled when wet. Keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system improve tilth, help maintain the organic matter content, and increase crop yields. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for most crops grown in the county except early-market and long-season varieties.

Without adequate drainage this soil is best suited to hay crops or pasture, if wetness-tolerant forage plants are used. Grazing when the soil is wet is the major concern of pasture management, because it can cause soil compaction, trampling of pasture plants, and the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, deferment of grazing, and restricted grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crops is fair to good. Seasonal wetness limits equipment use, causes moderate seedling mortality, and restricts rooting depth, which can lead to the uprooting of trees during windstorms. Seedlings that can withstand the seasonal high water table are best suited to this soil.

The seasonal high water table, low soil strength, poor soil compaction, slow or moderately slow permeability in the upper part of the subsoil, unstable and erodible substratum, and high risk of frost damage are serious limitations for most urban uses of this soil. Where this soil is used for septic tank absorption fields, seasonal wetness and slow or moderately slow permeability in the upper part of the subsoil require that the waste systems be specially designed. An additional concern is the possible contamination of ground water because water moves through the substratum at a moderately rapid rate. Drains around foundations minimize the seasonal wetness. Erosion and sloughing are serious hazards when the sandy substratum is exposed in excavations. Some areas are good pond sites, but the sides need to be gently sloped because the soil tends to slide or slump. The high clay content in the surface layer is a limitation for some recreational uses.

This Swormville soil is in capability subclass IIIw.

Te—Teel silt loam. This nearly level soil is deep and moderately well drained to somewhat poorly drained. It formed in silty alluvial deposits on flood plains along major streams in the county. Many areas are long and narrow and parallel the adjacent stream or creek. Other areas are roughly circular and lie in broad, shallow basins. Slope is 0 to 3 percent. Areas of this soil range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown silt loam 9 inches thick. The subsoil extends to a depth of 48 inches. It is dark grayish brown silt loam in the upper part; mottled, brown to dark brown silt loam in the middle part; and mottled, grayish brown silt loam in the lower part. The substratum is mottled, dark gray very fine sandy loam varved with silt loam to a depth of 60 inches.

Included with this soil in mapping are small intermingled areas of the Hamlin, Wayland, and Middlebury soils. The Hamlin soils are similar to this Teel soil but are well drained and are on small rises or higher benches on the flood plain. The Wayland soils are poorly drained and very poorly drained and are in low depressions or slack water areas. The Middlebury soils are underlain by sand and gravel. Areas of included soils range up to 3 acres.

This Teel soil is subject to common flooding for brief periods, usually in early spring. From January through May, the seasonal high water table rises into the subsoil and is somewhat controlled by the water level in the adjacent stream. Permeability is moderate. The available water capacity is high, and runoff is slow. There is generally no gravel in the surface layer and subsoil. Bedrock is at a depth of 5 feet or more. In unlimed areas, the surface layer ranges from strongly acid to neutral.

This soil is well suited to farming but is poorly suited to urban uses because of the flood hazard. Most of the acreage is farmed, is in woodland, or is idle.

This Teel soil is well suited to cultivated crops. Although flooding is a hazard, it usually occurs early in the spring before the crops are planted. In addition, the seasonal high water table can delay tillage operations in some years. Drainage of included wet spots improves the use of many fields, although drains can be difficult to install because suitable outlets are not available. At the proper soil moisture content this gravel-free soil is easy to till. The soil is suited to most field crops and to many specialized crops grown in the county. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops improve tilth and help maintain the organic matter content of the soil. Some of these practices also minimize scouring by floodwaters early in the spring. Streambanks may need protection from erosion in some areas (fig. 9).

The soil is also suited to pasture and hay. However, grazing when the soil is wet can restrict plant growth and compact the soil. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crops is good. The hazard of erosion equipment limitations, seedling mortality, and uprooting of trees during windstorms are generally not problems. Seedlings should be planted early in the spring when the soil is moist to insure a high rate of survival.

The flood hazard, seasonal wetness, and high risk of frost damage are serious limitations for most urban uses of this soil. Some areas that are not affected by flooding or wetness early in the spring are suitable for recreational uses. Other areas are good sites for pond reservoir areas.

This Teel soil is in capability subclass IIw.

To—Tioga silt loam. This nearly level soil is deep and well drained. It formed in recent alluvium on high parts of flood plains along major streams. Areas of this soil are mostly elongated and parallel to the adjacent stream. These areas range from 3 to 50 acres, but areas of 5 to 20 acres are more common. Slope ranges from 0 to 3 percent.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 10 inches thick. The subsoil extends to a depth of 51 inches. It is dark

Figure 9.—Teel silt loam soils on streambank are protected from lateral erosion.

yellowish brown silt loam in the upper and middle parts and mottled, dark yellowish brown sandy loam in the lower part. The substratum to a depth of 60 inches is mottled, dark yellowish brown sandy loam.

Included with this soil in mapping are small intermingled areas of the Middlebury and Hamlin soils. The moderately well drained to somewhat poorly drained Middlebury soils are in the low part of the flood plain. The Hamlin soils have more silt in the subsoil than this Tioga soil and are not underlain by sand or gravel. Areas of included soils make up 5 to 10 percent of the map unit and range up to 3 acres.

This Tioga soil is subject to flooding in some years. A seasonal high water table is in the upper part of the substratum from February through April. It is controlled by the water level in the adjacent stream. Permeability is moderate or moderately rapid in the surface layer and subsoil and moderate to rapid in the substratum. The available water capacity is moderate to high, and runoff is slow. Depth to bedrock is generally more than 5 feet. This soil is strongly acid to neutral in the surface layer and subsoil.

This soil is well suited to farming, but it is poorly suited to urban uses because of the hazard of flooding. Most of the acreage is in cultivated crops or hay. Some areas are wooded or used for pasture.

This Tioga soil is well suited to field crops and some vegetable crops. Although this soil is subject to flooding, floods generally occur early in the spring and do not interfere with crop production. In some areas, streambanks need to be protected—with riprap, for example—to prevent lateral cutting and erosion. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at proper soil moisture level, and rotating crops help maintain tilth and the naturally high organic matter content of the soil.

Cover crops and sod crops in the cropping system protect the surface from scour when flooding occurs. This nearly level soil is well suited to special crops that require irrigation and a stone-free plow layer.

This soil is also well suited to pasture and hay. Overgrazing can restrict plant growth and cause the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the main management concerns. Applications of lime are needed for optimum growth of pasture grasses.

The potential of this soil for wood crops is good. Only a small acreage is wooded. There are few limitations for timber production. Trees that require acid conditions do well on this soil.

Flooding is a serious limitation for most urban uses of this soil. Where the soil is used for septic tank absorption fields, pollution of the water supply can occur because of flooding and because the substratum is moderately to rapidly permeable. Some areas are well suited to recreational uses, such as athletic fields that require a gravel- and stone-free, nearly level site. This soil is an excellent source of topsoil.

This Tioga soil is in capability class I.

Uc—Udorthents, smoothed. These soils formed in deep manmade cuts or fills. Most of these areas are near industrial sites, urban developments, or construction sites. These soils consist of various kinds of excavated earthy material that has been stockpiled for use as fill or topdressing, soil and rock material that has been trucked from other areas and leveled, or soil deposits that are left in areas that have been excavated or deeply scalped. Fill material is variable in composition, but loamy, earthy material is dominant. In some places, the fill is mixed with slag or cinders around abandoned railroad yards. In other places, the earthy fill contains up to 10 percent concrete or asphalt and other trashy wastes.

This map unit is mainly nearly level or gently sloping. Some areas are steeper, particularly at the edge of cuts and along the sides of mounded fill. The areas are variable in shape, depending mostly on ownership boundaries. They range from 5 to 700 acres or more. The larger areas are in the city of Buffalo and adjacent suburbs near the larger industrial complexes.

Udorthents are too variable to have a typical profile, but in one of the more common profiles the surface layer is brown or grayish brown very gravelly loamy sand to silty clay loam 1 to 8 inches thick. The substratum is commonly light olive brown, brown, or dark yellowish brown and varies widely in texture from very gravelly loamy sand to silty clay.

Most areas are idle and support scattered weeds and grasses. A few areas have reverted to brush and tree saplings. Some areas, particularly around railroad yards, are used for urban development.

These Udorthents are mostly excessively drained to moderately well drained. Often the fill has been placed on very poorly drained to moderately well drained soils. Texture, stone content, soil reaction, and depth to bedrock vary considerably from one area to another. Bedrock, however, is usually at a depth of more than 5 feet. Depth to the seasonal high water table and permeability are variable and depend on topography, degree of compaction, soil texture, and other related factors.

These cut and fill areas are usually poorly suited to farm or recreational uses. Onsite investigation is essential to determine the feasibility of using areas for any purpose.

These Udorthents have not been assigned a capability subclass.

Ud—Urban land. This map unit is a miscellaneous area in which 80 percent or more of the soil surface is covered by asphalt, concrete, buildings, or other impervious structures. It includes parking lots, shopping and business centers, and industrial parks—in the cities of Buffalo and Lackawanna but also the business districts and adjacent shopping centers of villages in the suburban area near Buffalo. These areas generally range from 3 to 500 acres or more and are mostly nearly level to sloping.

Included in mapping are some landfills that have not been built upon or covered with asphalt. In many of these, several feet of fill has been placed over marshes and flood plains. The included areas range up to 3 acres.

It was not practical to examine and identify the soils underlying these impervious Urban land areas. Careful onsite investigation is necessary to determine the suitability and limitations of any abandoned areas for any proposed use. Some abandoned areas are suitable for asphalt-covered playgrounds or other recreation uses requiring a hard, impervious surface.

These Urban lands have not been assigned a capability subclass.

UeB—Urban land-Benson complex, 3 to 6 percent slopes. This complex is made up of gently sloping areas of Urban land and excessively drained and somewhat excessively drained Benson soils. Some areas of the Benson soils have been graded, scalped, or filled during urbanization. This complex is underlain by shallow limestone bedrock. These areas are generally about 5 to 100 acres. Slopes are long and gradual and are occasionally interrupted by ledges of rock outcrop.

A typical area of this complex is about 60 percent Urban land that is covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Benson soils; and 15 percent other soils. Urban land and Benson soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

The surface layer of the undisturbed Benson soil is typically dark grayish brown very cherty loam about 6 inches thick. The subsoil is dark yellowish brown very cherty loam about 6 inches thick. The substratum is brown very cherty loam about 3 inches thick. Grayish cherty limestone bedrock is at a depth of 15 inches.

Included with this complex in mapping are areas of the loamy Farmington soils that are shallow to bedrock and the moderately deep Wassaic soils. Also included are a few areas of the Benson soil that is filled over by heterogeneous soil material. Areas of included soils range from 1/4 acre to 3 acres.

Permeability is moderate in the Benson soil. The available water capacity is very low or low, and runoff is medium. Depth to bedrock is 10 to 20 inches, and reaction ranges from neutral to moderately alkaline in undisturbed areas. Runoff is rapid from the relatively impermeable Urban land part of this complex.

This complex is not suited to farming, because it is in highly urbanized areas.

Parts of this Urban land-Benson complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. Individual areas of the Benson soils that are not urbanized are generally less than 800 square feet. The potential of these areas as building sites is poor, because they are shallow to limestone bedrock and small. Most construction is on sites of demolished buildings.

The open areas of Benson soils can be used for lawns, shrubs, and vegetable gardens; however, preparing seedbeds and maintaining gardens are somewhat difficult because of the high content of cherty fragments. Lawns and gardens generally need watering because the soil is droughty. Tree growth is limited because rooting depth is restricted and existing trees or buildings provide too much shade. Some larger areas are suitable for local parks. The high chert fragment content is a hazard for recreation uses such as playgrounds. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Benson complex has not been assigned a capability subclass.

Uf—Urban land-Canandaigua complex. This complex consists of nearly level areas of Urban land and deep, poorly drained and very poorly drained Canandaigua soils. Some areas of the Canandaigua soils have been slightly altered by grading, scalping, filling, and landscaping for construction and urbanization. Areas of this complex range from about 3 to 60 acres and are irregular in shape. Slope ranges from 0 to 3 percent.

This complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent is undisturbed Canandaigua soils; and 15 percent other soil material. Urban land and the Canandaigua soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Canandaigua soils have a surface layer of very dark gray silt loam about 9 inches thick. The subsoil extends to a depth of 37 inches. It is mottled, gray silt loam in the upper part; mottled, gray to grayish brown silt loam in the middle part; and mottled, brown silt loam in the lower part. The substratum to a depth of 60 inches or more is mottled, light brownish gray silt loam. In places the surface layer is very fine sandy loam.

Included with this complex in mapping are areas of the nearly level, sand-mantled Cheektowaga soils, the clay-mantled Getzville soils, and the clayey Lakemont soils. Also included are a few areas of Udorthents, smoothed, that have extensive additions of earthy fill material or that have been excavated. Areas of included soils range up to 3 acres.

The Canandaigua soil has a seasonal high water table at or near the surface from November through May. Permeability of the subsoil and substratum is moderately slow, and it is variable in areas that are dominantly cuts and fills. The available water capacity is high, and runoff is slow in the undisturbed areas of this soil, bedrock is at a depth of more than 5 feet, and the surface layer ranges from medium acid to mildly alkaline. Runoff is rapid from the relatively impermeable Urban land part of this complex.

This Urban land-Canandaigua complex is not suited to farming because it is in highly urbanized areas. The few areas that are not built up include narrow plots between streets and sidewalks, very small yards, courtyards, and small traffic islands and circles. Because these areas generally cover less than 1,000 square feet, although a few are larger, and because of their wetness and occasional ponding, they are poorly suited to building. Most new building is on sites of demolished buildings.

Most undisturbed areas of this complex are subject to heavy foot traffic and are shaded by buildings. Many of these areas are poorly suited to lawns, landscaping, and vegetable gardens because of their prolonged wetness, size, and location. Prolonged wetness also limits the use of some larger areas for recreation. Onsite investigation is necessary to determine the suitability and limitations for any proposed use.

This Urban land-Canandaigua complex has not been assigned a capability subclass.

Ug—Urban land-Cayuga complex. This complex consists of nearly level areas of Urban land and deep, well drained and moderately well drained Cayuga soils. The Cayuga soils formed in a mantle of clayey lake sediments underlain by glacial till deposits. This complex is in housing developments, shopping centers, industrial parks, and other similar urban uses. Areas of this complex range from about 3 to 500 acres and are rectangular or irregular in shape. Slope ranges from 0 to 3 percent.

This complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious manmade surfaces; about 30 percent undisturbed Cayuga soils; and 10 percent other soils. Urban land and Cayuga soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Cayuga soils have a surface layer of dark grayish brown silt loam about 8 inches thick. The subsurface layer is mottled, light brown silt loam about 2 inches thick. The subsoil extends to a depth of 26 inches. It is mottled, brown heavy silty clay loam in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is mottled, reddish brown gravelly loam. In places the surface layer is silty clay loam.

Included with this complex in mapping are areas of the gently sloping Collamer soils that have a till substratum, the gently sloping Cayuga soils, and a few areas of deep fill deposits. Areas of included soils range up to 3 acres.

In April and May the Cayuga soils have a perched seasonal high water table in the lower part of the subsoil. The undisturbed Cayuga soils are slowly permeable in the subsoil and substratum, the available water capacity is moderate to high, and runoff is medium. Bedrock is at a depth of more than 5 feet. In most areas the surface layer is medium acid to neutral. Runoff is rapid from the relatively impermeable Urban land part of this complex.

This Urban land-Cayuga complex is not suited to farming because it is in highly urbanized areas. Parts of this complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, areas between industrial buildings, and small traffic islands and circles. Because these areas generally cover less than 1,000 square feet, they are poorly suited to building. Most building activity is on sites of demolished buildings.

Most undisturbed areas of this complex are subject to heavy foot traffic and are shaded by tall buildings. These areas are only moderately suited to lawns, trees, shrubs, and vegetable gardens. Because there is limited open space, this complex is not suited to recreational uses, but a few larger areas are potential sites for local parks or playgrounds. Onsite investigation is necessary to determine the suitability and limitations for any proposed use.

This Urban land-Cayuga complex has not been assigned a capability subclass.

Uh—Urban land-Churchville complex. This complex consists of nearly level areas of Urban land and deep, somewhat poorly drained Churchville soils. These Churchville soils formed in clayey deposits underlain by glacial till. This complex is in housing developments, shopping centers, industrial parks, and other similar uses in and around the city of Buffalo. Some open areas of the Churchville soils have been slightly altered by minor cuts and fills during construction. Areas of this complex are irregular in shape and range from about 5 to 600 acres. Slope ranges from 0 to 3 percent.

This complex is about 65 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Churchville soils; and 10 percent other miscellaneous areas. Urban land and Churchville soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Churchville soils have a surface layer of very dark grayish brown silt loam 9 inches thick. The subsurface layer is mottled, pinkish gray silt loam about 2 inches thick. The subsoil extends to a depth of 26 inches. It is reddish brown silty clay loam in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches or more is mottled, reddish gray gravelly loam.

Included with this complex in mapping are areas of the nearly level Niagara soils that have a till substratum, the reddish Ovid soils, and areas of deep fill deposits.

From December through May a perched seasonal high water table is in the upper part of the subsoil of the Churchville soils. These soils are slowly or very slowly permeable. The available water capacity is moderate to high, and runoff is slow. Bedrock is at a depth of more than 5 feet. The surface layer is medium acid to neutral. Runoff is rapid in the relatively impermeable Urban land part of this complex.

Parts of this complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, areas between industrial buildings, and small traffic islands and circles. Because these areas generally cover less than 800 square feet, they are poorly suited to building. Most building activity is on sites of demolished buildings.

Some undisturbed areas of this complex are subject to heavy foot traffic and are shaded by tall buildings and trees. Many areas are poorly suited to lawns, recreational uses, and vegetable gardens because of the seasonal wetness, clayey subsoil texture, and shading. High risk of frost damage, low soil strength, and slow or very slow permeability are additional limitations for further development on this complex. Onsite investigation is necessary to determine the suitability and limitations for any proposed use.

This Urban land-Churchville complex has not been assigned a capability subclass.

Uk—Urban land-Claverack complex. This complex consists of nearly level areas of Urban land and moderately well drained Claverack soils. The Claverack soils formed in clayey lake-laid sediments mantled with sandy deposits. This complex is in urban areas, mostly in the city of Buffalo and its metropolitan area. Slope ranges from 0 to 3 percent. Areas of this complex range from about 3 to 100 acres or slightly more and are irregular in shape.

This complex is about 60 percent Urban land that is covered by concrete, asphalt, buildings, or other impervious surfaces; About 30 percent undisturbed Claverack soils; and 10 percent other soils. Urban land and Claverack soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Claverack soils have a surface layer of dark brown loamy fine sand about 10 inches thick. The subsoil extends to a depth of 35 inches. It is strong brown loamy fine sand in the upper part; mottled, brown loamy fine sand in the middle part; and mottled, dark brown fine sandy loam in the lower part. The substratum to a depth of 60 inches is mottled, dark brown clay in the upper part and mottled, reddish brown clay in the lower part. In places the surface layer is fine sand or sand.

Included with this complex in mapping are the nearly level to gently sloping gravel-mantled Varysburg soils, the gently sloping Claverack soils, and a few areas of deep cuts or fills. Areas of included soils range from 1/4 acre to 3 acres.

From November through May a perched seasonal high water table is in the lower part of the subsoil of the Claverack soil. Permeability is rapid in the sandy material and slow or very slow in the clayey substratum. The available water capacity is low to moderate, and runoff is slow. This soil generally contains no gravel, and bedrock is at a depth of more than 5 feet. Most unlimed areas of this soil are strongly acid to neutral in the surface layer and subsoil. Runoff is rapid from the relatively impervious Urban land part of this complex.

This Urban land-Claverack complex is not suited to farming because it is in highly urbanized areas. The few parts of this complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, areas between industrial buildings, and small traffic islands and circles. Because these undisturbed areas generally cover less than 800 square feet, they are too small for additional building. Most new construction is on sites of demolished buildings.

Most of the undisturbed areas of this complex are moderately suited to lawns and vegetable gardens, but droughtiness in midsummer is a problem. The organic matter content of these soils can be improved by composting. Increasing the organic matter content improves the available water capacity of the soil. A few large undeveloped areas are suited to parks and recreational uses. Onsite investigation is necessary to determine the suitability and limitation for any proposed use.

This Urban land-Claverack complex has not been assigned a capability subclass.

UmA—Urban land-Collamer complex, 1 to 6 percent slopes. This complex consists of nearly level and gently sloping areas of Urban land and silty, deep and moderately well drained Collamer soils. It is used for housing developments, shopping centers, industrial sites, and similar purposes. This complex is in urbanized areas in the city of Buffalo and its metropolitan area. Areas of this complex range from about 5 to 500 acres and are oblong or irregular in shape.

This complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 30 percent undisturbed Collamer soils; and 10 percent other soils. Urban land and Collamer soils occur in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Collamer soils have a surface layer of dark grayish brown silt loam about 8 inches thick. The subsurface layer is mottled, pale brown light silt loam about 2 inches thick. The subsoil extends to a depth of 32 inches. It is mottled, pale brown light silt loam in the upper part; mottled, brown heavy silt loam in the middle part; and mottled, dark yellowish brown silty clay loam in the lower part. The substratum to a depth of 60 inches is mottled, brown silt loam with thin bands of fine sand and clay. In places the surface layer is fine sandy loam.

Included with this complex in mapping are a few areas of the somewhat poorly drained Niagara soils on foot slopes and in shallow depressions and a few areas of Udorthents, smoothed, which consists of cut and fill material that has not been paved or built upon. Areas of included soils range up to 3 acres.

The Collamer soil has a seasonal high water table in the spring. Permeability of the substratum is slow or moderately slow. The available water capacity is high, and runoff is medium to moderately rapid in undisturbed areas of this soil. This soil generally contains no gravel, and bedrock is at a depth of more than 5 feet. The surface layer and upper part of the subsoil are strongly acid to neutral. Runoff is rapid from the relatively impervious Urban land part of this complex. The hazard of erosion is severe.

This Urban land-Collamer complex is not suited to farming because it is in highly urbanized areas. The few areas of this complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, areas between industrial buildings, and small traffic islands and circles. Because these areas generally cover less than 900 square feet, they are poorly suited to building. Most building activity is on sites of demolished buildings.

Most of the undisturbed areas of the Collamer soil are suited to lawns and gardens, but their size and location dictate their general suitabilities. A few larger areas are suited to parks and recreational uses. Onsite investigation is necessary to determine the suitability and limitations for any proposed use. A capability subclass is not assigned.

This Urban land-Collamer complex has not been assigned a capability subclass.

UnB—Urban land-Colonie complex, 3 to 6 percent slopes. This complex is made up of gently sloping areas of Urban land and sandy, somewhat excessively drained to well drained Colonie soils. Some areas of this complex have been graded, cut, filled, or otherwise disturbed during urbanization. This complex is in the city of Buffalo and its metropolitan area. Areas of this complex are generally about 5 to 100 acres or slightly more and are oblong or irregular in shape.

A typical area of this complex is about 60 percent Urban land that is covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Colonie soils; and 15 percent other soils. Urban land and Colonie soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Colonie soils have a surface layer of dark grayish brown loamy fine sand about 7 inches thick. The subsoil extends to a depth of 60 inches. It is strong brown loamy fine sand in the upper part, yellowish brown loamy fine sand in the middle part, and pale brown fine sand in the lower part. The substratum to a depth of 70 inches is light grayish brown fine sand. In places the surface layer is fine sand.

Included with this complex in mapping are areas of the gently sloping Alton and Arkport soils. Also included are Udorthents, smoothed, which are areas of deep fill or areas that have been excessively scraped or scalped but have not been built upon. Areas of included soils range up to 3 acres.

The Colonie soils are rapidly or moderately rapidly permeable. The available water capacity is low and, runoff is medium. These soils generally contain no gravel, and bedrock is at a depth of more than 5 feet. The surface layer and subsoil range from strongly acid to slightly acid. Runoff is rapid from the relatively impervious Urban land part of this complex.

This Urban land-Colonie complex is not suited to farming because it is in highly urbanized areas. The few areas that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. Because these areas generally cover less than 1,000 square feet, they are poorly suited to building. Most building activity is on sites of demolished buildings.

Most of the undisturbed Colonie soils are in areas that are subject to heavy foot traffic and are shaded by tall buildings. Establishing and maintaining lawns, shrubs, and vegetable gardens are difficult because of sandy texture, low soil fertility, and droughtiness of the soil. The organic matter content of these soils can be improved by adding composted material. Increased organic matter content improves the available water capacity of the soil. Proper liming and fertilizing and frequent watering during dry periods help maintain attractive grass and shrubs. A few larger areas are suited to parks or recreational uses. Drains around foundations are usually not necessary on developed areas of the Colonie soils. Onsite investigation is necessary to determine the suitability and limitations for any proposed use.

This Urban land-Colonie complex has not been assigned a capability subclass.

Uo—Urban land-Cosad complex. This complex consists of nearly level areas of Urban land and somewhat poorly drained Cosad soils. The Cosad soils formed in clayey lake-laid sediments that have a mantle of sandy deposits 20 to 40 inches thick. This complex is on relatively flat landscapes in the city of Buffalo and its metropolitan area. These areas are generally about 5 to 100 acres. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Cosad soils; and 15 percent other soils. Urban land and Cosad soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Cosad soils have a surface layer of very dark grayish brown loamy fine sand 9 inches thick. The subsoil extends to a depth of 32 inches. It is mottled, yellowish brown loamy fine sand in the upper part; mottled, brown fine sand loam in the middle part; and mottled, brown silty clay in the lower part. The substratum to a depth of 60 inches is reddish brown varved silty clay. In places the surface layer is fine sand or sand.

Included with this complex in mapping are areas of the nearly level, deep, gravelly Red Hook and clayey Rhinebeck soils. Also included are Udorthents, smoothed, which are areas of deep fills or cuts that have not been paved or built upon. Areas of included soils range up to 3 acres.

The Cosad soils have a perched seasonal high water table from November through May. They are rapidly permeable in the sandy mantle and slowly or very slowly permeable in the underlying clayey layers. The available water capacity is low to moderate, and runoff is slow. These soils generally contain no gravel and are strongly acid to slightly acid in the surface layer. Runoff from the relatively impermeable Urban land part of this complex is rapid.

This Urban land-Cosad complex is not suited to farming because it is in highly urbanized areas. The few areas of this complex that are not built up included narrow plots between streets and sidewalks, small yards, courtyards, areas between industrial buildings, and small traffic islands and circles. These areas are poorly suited to building because they have a seasonal high water table, low strength, and a clayey substratum and generally cover less than 800 square feet. A few homes and structures show signs of settling because the soil has low strength. Most building activity is on sites of demolished buildings.

Most of the undisturbed areas are subject to heavy foot traffic and are shaded by tall buildings. Establishing lawns or gardens on these Cosad soils is difficult because of seasonal wetness, sandy surface layer texture, low organic matter content, and the tendency of the soil to be droughty in the root zone in midsummer. Drainage and increasing the organic matter in the soil minimize these problems. Onsite investigation is necessary to determine the suitability and limitations for any proposed use.

This Urban land-Cosad complex has not been assigned a capability subclass.

Up—Urban land-Galen complex. This complex consists of nearly level areas of Urban land and moderately well drained Galen soils. This complex is in the city of Buffalo and its metropolitan area. The areas are generally 3 to 100 acres or slightly more and are oblong or irregular in shape. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 60 percent Urban land that is covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Galen soils; and 15 percent other soils. Urban land and Galen soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Galen soils have a surface layer of dark brown very fine sandy loam about 8 inches thick. The subsoil extends to a depth of 36 inches. It is mottled, brownish yellow fine sandy loam in the upper part; mottled, brown loamy fine sand in the middle part; and mottled, brown loamy fine sand with fine sandy loam bands in the lower part. The substratum to a depth of 60 inches is mottled, pale brown fine sand. In places the surface layer is fine sandy loam.

Included with this complex in mapping are areas of the nearly level Elnora soils. Also included are Udorthents, smoothed, which are areas of deep fill deposits or deep cuts that have not been paved or built upon. Areas of included soils range up to 3 acres.

The Galen soil has a seasonal high water table in the lower part of the subsoil in the spring. Permeability of the subsoil is moderate, the available water capacity is moderate, and runoff is slow. The soil generally does not contain gravel. The surface layer is strongly acid to neutral. The Urban land areas of this complex are relatively impermeable and have very rapid runoff.

Because this Urban land-Galen complex is highly urbanized, it is not suited to farming. The few areas that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. These areas are generally poorly suited to additional building because they are subject to seasonal wetness and low strength and generally cover less than 900 square feet. Most building activity is on sites of demolished buildings.

Some of the undisturbed areas are subject to heavy foot traffic or are shaded by tall buildings. Most areas of the Galen soils are well suited to lawns, shrubs, and vegetable gardens. Liming, fertilizing, and watering during dry periods help maintain quality lawns and shrubs. A few of the larger undisturbed areas are suitable for parks or playgrounds. Onsite investigation is necessary to determine the suitability or limitations for any proposed use.

This Urban land-Galen complex has not been assigned a capability subclass.

UrA—Urban land-Lima complex, 1 to 6 percent slopes. This complex consists of nearly level to gently sloping areas of Urban land and moderately well drained Lima soils. The Lima soils formed in loamy glacial till deposits. In places these soils have been slightly altered by grading and landscaping. This complex is in the city of Buffalo and its metropolitan area. Areas are generally about 3 to 200 acres or more and are oblong or irregular in shape.

A typical area of this complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 30 percent undisturbed Lima soils; and 10 percent other soils. Urban land and Lima soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Lima soils have a surface layer of very dark grayish brown loam about 9 inches thick. The subsurface layer is mottled, light brownish gray loam about 2 inches thick. The subsoil extends to a depth of 26 inches. It is mottled, brown silt loam. The substratum to a depth of 60 inches or more is mottled, brown gravelly silt loam. In places the surface layer is silt loam.

Included with this complex in mapping are areas of the nearly level, well drained, Honeoye soils. Also included are Udorthents, smoothed, which are areas of deep fills or excavations. Areas of included soils range up to 3 acres.

The Lima soils have a perched seasonal high water table in the lower part of the subsoil in the spring. Permeability is moderate in the subsoil and slow or very slow in the substratum. The available water capacity is moderate to high, and runoff is medium. The surface layer and subsoil are medium acid to mildly alkaline. Runoff is very rapid in the relatively impermeable Urban land part of this complex.

Because this Urban land-Lima complex is highly urbanized, it is not suited to farming. The few areas that are not built upon include narrow plots between streets and sidewalks, small yards, courtyards, areas between large buildings, and small traffic islands and circles. These undisturbed areas of Lima soils generally cover less than 1,000 square feet. Most building activity is on sites of demolished buildings.

Some of the undisturbed areas are subject to heavy foot traffic or are shaded by tall buildings. These areas are generally suited to lawns, shrubs, and vegetable gardens. A few of the larger areas are suited to parks or recreational uses. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Lima complex has not been assigned a capability subclass.

Us—Urban land-Niagara complex. This complex consists of nearly level areas of Urban land and somewhat poorly drained Niagara soils. The Niagara soils formed in silty lake-laid deposits. This complex is on relatively flat landscapes in the city of Buffalo and its metropolitan area. Areas of this complex are 5 to over 800 acres and are oblong or irregular in shape. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 30 percent undisturbed Niagara soils; and 10 percent other soils.

Typically, these Niagara soils have a surface layer of dark brown silt loam about 11 inches thick. The subsoil extends to a depth of 27 inches. It is mottled, yellowish brown silt loam in the upper part and mottled, dark brown silt loam in the lower part. The substratum, to a depth of 60 inches, is mottled, dark brown silt loam and olive brown coarse silt, and it is very fine sand below 60 inches. In places the surface layer is loam or very fine sandy loam.

Included with this complex in mapping are areas of the deep, nearly level Raynham soils. Also included are Udorthents, smoothed, which are areas of deep fills or excavations. Areas of included soils are 1/4 acre to 3 acres.

The Niagara soils have a seasonal high water table in the upper part of the subsoil from December through May. Permeability of the Niagara soils is moderately slow, the available water capacity is high, and runoff is slow. There is generally no gravel, and bedrock is more than 5 feet deep. In unlimed areas, reaction ranges from strongly acid to neutral in the surface layer. Runoff is rapid from the relatively impermeable Urban land part of this complex.

The few areas of this Urban land-Niagara complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. These undisturbed areas are poorly suited to building because they are seasonally wet, have low strength, and generally cover less than 800 square feet. Many homes show signs of settling mainly because of low soil strength and frost heaving. Most building activity is on sites of demolished buildings.

Some of the undisturbed areas are subject to heavy foot traffic or are shaded by tall buildings. With subsurface drainage, these areas of Niagara soils produce better lawns, shrubs, and vegetable gardens. Because of seasonal wetness, most areas are not well suited to recreational uses. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Niagara complex has not been assigned a capability subclass.

Ut—Urban land-Odessa complex. This complex consists of nearly level areas of Urban land and somewhat poorly drained Odessa soils. The Odessa soils formed in clayey lake-laid sediments. This complex is on relatively flat landscapes in the city of Buffalo and its metropolitan area. These areas are generally about 5 to 600 acres and are mostly irregular in shape. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Odessa soils; and 15 percent other soils. Urban land and Odessa soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Odessa soils have a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 22 inches. It is mottled, pinkish gray silty clay in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is varved reddish brown, gray, reddish gray, and weak red silty clay. In places the surface layer is silty clay loam.

Included with this complex in mapping are small areas of the nearly level Rhinebeck and Lakemont soils. The Rhinebeck soils formed in gray color sediments, and the Lakemont soils are in a few depressions. Also included are Udorthents, smoothed, which are areas of deep fills or very deep cuts that have not been paved or built upon. Areas of included soils range up to 3 acres.

The Odessa soils have a perched seasonal high water table in the upper part of the subsoil from December through May. Permeability is slow or very slow in the Odessa soils. The available water capacity is moderate to high, and runoff is slow. Bedrock is at a depth of 5 feet or more. In most unlimed areas the surface layer is medium acid to neutral. Runoff is rapid from the relatively impermeable Urban land part of the complex.

This Urban land Odessa complex is not suited to farming because it is highly urbanized. The few areas of this complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. These undisturbed areas are poorly suited to building because they are seasonally wet, have low strength, and generally cover less than 800 square feet. Some older homes and buildings show signs of settling. Most building activity is on sites of demolished buildings.

Some of the undisturbed areas of Odessa soils are subject to heavy foot traffic and are shaded by tall buildings. Because of seasonal wetness and clayey subsoil texture, lawns and gardens are difficult to establish on these soils. The small size of most undisturbed areas limits their suitability for many uses, such as recreational areas and parks. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Odessa complex has not been assigned a capability subclass.

Uu—Urban land-Schoharie complex. This complex is made up of nearly level areas of Urban land and deep, well drained to moderately well drained Schoharie soils. The Schoharie soils formed in reddish, clayey, lake-laid sediments. This complex is on relatively flat landscapes in the city of Buffalo and its metropolitan area. Areas of this complex are generally about 5 to 800 acres or slightly more and are irregular in shape. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 35 percent undisturbed Schoharie soils; and 5 percent other soils. Urban land and Schoharie soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, Schoharie soils have a surface layer of dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 31 inches. It is brown silty clay loam in the upper part; reddish brown silty clay in the middle part; and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is reddish brown varved silty clay. In places the surface layer is silty clay loam.

Included with this soil in mapping are small intermingled areas of the somewhat poorly drained Odessa soils and the gently sloping Schoharie soils. Also included are Udorthents, smoothed, which are areas of deep fills or excavations. Areas of included soils range up to 3 acres.

In the spring, the Schoharie soils have a perched seasonal high water table in the lower part of the subsoil. Permeability is slow or very slow, the available water capacity is moderate to high in undisturbed areas, and runoff is medium. Bedrock is at a depth of more than 5 feet. Reaction is medium acid to neutral in the surface layer. Runoff is rapid in the Urban land areas of this complex.

This Urban land-Schoharie complex is not suited to farming because of the high degree of urbanization. The few areas that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. These undisturbed areas are limited for building because they have a clayey subsoil and low strength and generally cover less than 800 square feet. Most building activity is on sites of demolished buildings.

Some of the undisturbed areas are subject to heavy foot traffic or are shaded by tall buildings. These areas are moderately suited to lawns, shrubs, and vegetable gardens. Because of slow or very slow permeability and small size, these areas only have limited suitability for recreational uses and for small parks. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Schoharie complex has not been assigned a capability subclass.

Uv—Urban land-Swormville complex. This complex is made up of nearly level areas of Urban land and somewhat poorly drained Swormville soils. The Swormville soils formed in silty and clayey lake-laid sediments underlain by sandy deposits. This complex is on relatively flat landscapes in the city of Buffalo and its metropolitan area. Areas of this complex are generally about 5 to 100 acres and are irregular in shape. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 70 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Swormville soils; and 5 percent other soils. Urban land and Swormville soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Swormville soils have a surface layer of dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 26 inches. It is mottled, yellowish brown silty clay loam in the upper part; mottled, yellowish brown silt loam in the middle part; and mottled, light yellowish brown loamy fine sand in the lower part. The substratum to a depth of 60 inches is mottled, gray fine sand. In places the surface layer is loam or silty clay loam.

Included with this soil in mapping are Udorthents, smoothed, which are areas of deep fill deposits or excavations that are not paved or built upon. Some areas are gently sloping. Areas of included soils range from 1/4 acre to 3 acres.

From November through May, the Swormville soils have a seasonal high water table in the upper part of the subsoil. Permeability is moderately slow to slow in the surface layer and upper part of the subsoil and moderately rapid in the substratum in the undisturbed Swormville soils, the available water capacity is moderate, and runoff is slow. Bedrock is at a depth of more than 5 feet. The surface layer is strongly acid to neutral. Runoff is rapid from the relatively impermeable Urban land areas of this complex.

This Urban land-Swormville complex is poorly suited to farming because it is highly urbanized. The few areas that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. These undisturbed areas are poorly suited to building because they are seasonally wet, have low strength, and generally cover less than 1,000 square feet. Sloughing in excavated areas is a problem because of the unstable substratum. Most building activity is on sites of demolished buildings.

The undisturbed Swormville soils are generally not suitable for recreational uses, lawns, shrubs, and vegetable gardens because they are seasonally wet and have a heavy textured subsoil. Drainage is needed for most uses. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Swormville complex has not been assigned a capability subclass.

Uw—Urban land-Teel complex. This complex is made up of nearly level areas of Urban land and moderately well drained to somewhat poorly drained Teel soils. The Teel soils formed in silty sediments deposited on flood plains. This complex is in the city of Buffalo and its metropolitan area. Areas of this complex are generally about 3 to 100 acres and are oblong or elongated. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious manmade surfaces; about 25 percent undisturbed Teel soils; and 15 percent other soils. Urban land and Teel soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Teel soils have a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 48 inches. It is dark grayish brown silt loam in the upper part and mottled, grayish brown silt loam in the lower part. The substratum to a depth of 60 inches is mottled, dark gray very fine sandy loam varved with silt loam. In places the surface layer is loam.

Included with this complex in mapping are areas of the well drained Hamlin soils and the poorly drained and very poorly drained Wayland soils on adjacent flood plains. Also included are Udorthents, smoothed, which are areas of deep fill deposits or areas where the original soil has been removed or excessively scalped. A few areas are gently sloping. Areas of included soils range from 1/4 acre to 3 acres.

The Teel soils have a seasonal high water table in the lower part of the subsoil from January through May. Permeability is moderate, the available water capacity is high, and runoff is slow. The surface layer is strongly acid to neutral, and the subsoil is strongly acid to mildly alkaline. Runoff is rapid in the relatively impermeable Urban land part of this complex. Most areas of the complex are subject to occasional flooding unless protected by manmade dikes or levees.

The few areas of this complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. These undisturbed areas are poorly suited to building because of the flood hazard and seasonal wetness, and they generally cover less than 1,000 square feet. However, flood control structures are along some of the major creeks and streams. Most building activity is on sites of demolished buildings.

The undisturbed areas of Teel soils are suited to lawns and shrubs. These gravel-free soils are easy to till and make excellent garden sites. Some areas are suitable for small parks and recreation areas. Flooding is more common along the smaller streams that lack flood control structures. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Teel complex has not been assigned a capability subclass.

Ux—Urban land-Wassaic complex. This complex is made up of nearly level areas of Urban land and moderately deep Wassaic soils. The Wassaic soils formed in a thin mantle of glacial till underlain by limestone bedrock at a depth of 20 to 40 inches. This complex is in the city of Buffalo and its metropolitan area. Areas of this complex are generally about 5 to 400 acres and are irregular in shape. Slope ranges from 0 to 3 percent.

A typical area of this complex is about 60 percent Urban land that is mostly covered by concrete, asphalt, buildings, or other impervious manmade surfaces; about 35 percent undisturbed Wassaic soils; and 5 percent other soils. Urban land and Wassaic soils occur together in such an intricate pattern that it was not practical to separate them in mapping.

Typically, these Wassaic soils have a surface layer of very dark grayish brown silt loam about 10 inches thick. The subsurface layer is grayish brown loam about 1 inch thick. The subsoil extends to a depth of 23 inches. It is brown silt loam in the upper part and brown gravelly silt loam in the lower part. The substratum is brown gravelly loam. Gray, hard limestone bedrock is at a depth of 28 inches. In places the surface layer is loam.

Included with this soil in mapping are areas of Udorthents, smoothed, which are deep fill deposits or areas that have been excessively scalped and not built up. A few areas are gently sloping. Areas of included soils range from 1/4 acre to 3 acres.

In March and April, the Wassaic soils have a perched seasonal high water table above the moderately deep bedrock in some places. Permeability is moderate or moderately slow in the subsoil, the available water capacity is low to moderate, and runoff is slow to moderate. The surface layer is medium acid to neutral. Runoff is rapid in the relatively impermeable Urban land part of this complex.

The few areas of this complex that are not built up include narrow plots between streets and sidewalks, small yards, courtyards, and small traffic islands and circles. These undisturbed areas are poorly suited to building because they are moderately deep to limestone bedrock and generally cover less than 800 square feet. However, the bedrock is a solid foundation for industrial or other large buildings. Most building activity is on sites of demolished buildings.

Some of the relatively undisturbed areas are subject to heavy foot traffic and are shaded by tall buildings. The undisturbed areas are moderately suited to lawns, shrubs, and vegetable gardens. Small stones can be bothersome in preparing seedbeds. Watering is generally needed to maintain high quality lawns and gardens because the available water capacity is low to moderate. A few areas are suitable for parks. Onsite investigation is necessary to determine the suitability and limitations of this complex for any proposed use.

This Urban land-Wassaic complex has not been assigned a capability subclass.

VaB—Valois gravelly silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on undulating reglaciated outwash moraines and other moraines. This soil is generally along lower valley sides, and it formed in glacial till mixed with glacial outwash deposits. Areas of this soil are irregular in shape and range from 3 to 75 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of dark grayish brown gravelly silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. It is yellowish brown gravelly silt loam in the upper part, yellowish brown gravelly loam in the middle part, and brown gravelly sandy loam in the lower part. The substratum to a depth of 65 inches or more is grayish brown very gravelly sandy loam.

Included with this soil in mapping are small intermingled areas of the Mardin and Chenango soils. The Mardin soils have a fragipan in the subsoil, and the Chenango soils formed in glacial outwash deposits that have more than 35 percent gravel in the subsoil. Also included in mapping are small areas of the nearly level Valois soils. Areas of included soils range from 1/2 acre to 3 acres.

The permeability of this Valois soil is moderate in the surface layer and upper part of the subsoil and moderate or moderately rapid in the lower part of the subsoil and in the substratum. The available water capacity is moderate, and runoff is medium. Gravel makes up 15 to 35 percent of the surface layer. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and subsoil are very strongly acid to medium acid.

This soil is well suited to farming and many urban uses. Most of the acreage is in field crops, hay, pasture, or woodland.

This Valois soil is well suited to cultivated crops. Gravel and occasional cobblestones in the surface layer interfere with cultivating some crops and increase the rate of wear of machinery. Erosion is a slight hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling across slopes, and including sod crops in the cropping system help maintain good tilth, increase the organic matter content, and reduce the erosion hazard. In some years, droughtiness can hinder crop growth.

This soil is also well suited to hay crops and pasture. Overgrazing can restrict plant growth. Proper stocking, rotation of pastures, and yearly mowing are the main management needs. Because this soil is naturally acid, applications of lime improve the growth of most pasture plants.

The potential of this soil for wood crops is good. Seedlings that can withstand acid conditions are best suited to this soil and should be planted early in the spring when the soil is moist. The hazard of erosion and restriction of equipment use are generally not problems.

This soil is suited to many urban uses, but small stones and moderate or moderately rapid permeability in the substratum are minor limitations for some urban uses. Many areas are good sites for dwellings and recreational uses, such as campsites and picnic areas.

This Valois soil is in capability subclass IIe.

VaC—Valois gravelly silt loam, 8 to 15 percent slopes. This sloping soil is deep and well drained. It is on rolling reglaciated moraines. This soil is generally along lower valley sides, and it formed in glacial till mixed with glacial outwash deposits. Areas of this soil are oblong or irregular in shape and range from 3 to 60 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown gravelly silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. It is yellowish brown gravelly silt loam in the upper part, yellowish brown gravelly loam in the middle part, and brown gravelly sandy loam in the lower part. The substratum to a depth of 65 inches or more is grayish brown very gravelly sandy loam.

Included with this soil in mapping are small intermingled areas of the Mardin and Chenango soils. The Mardin soils have a fragipan in the subsoil, and the Chenango soils have 35 percent gravel in the subsoil. Also included in mapping are small areas of the gently sloping Valois soils. Areas of included soils range from 1/2 acre to 3 acres.

The permeability of this Valois soil is moderate in the surface layer and upper part of the subsoil and moderate or moderately rapid in the lower part of the subsoil and in the substratum. The available water capacity is moderate, and runoff is medium to rapid. Gravel makes up 15 to 35 percent of the surface layer. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suited to farming and some urban uses. Most areas are in field crops, hay, pasture, or woodland. Some areas are idle.

This Valois soil is suited to cultivated crops. Gravel and occasional cobblestones in the surface layer interfere with cultivating some crops and increase the rate of wear of machinery. Erosion is a serious hazard in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, stripcropping, tilling across slopes, and including sod crops in the cropping system help maintain good tilth, increase the organic matter content, and control erosion. In some years, droughtiness can hinder crop growth.

This soil is well suited to hay crops and pasture. Overgrazing can restrict plant growth and increase erosion. Proper stocking, rotation of pastures, and yearly mowing are the main management needs. Because this soil is naturally acid, applications of lime improve the growth of most pasture plants.

The potential of this soil for wood crops is good. Seedlings that can withstand acid conditions are best suited to this soil and should be planted early in the spring when the soil is moist. There are generally no restrictions on the use of equipment. Placing logging trails across the slope reduces the hazard of trail gullying.

This soil is suited to many urban uses, but small stones, slope, and moderate to moderately rapid permeability in the substratum are limitations for some uses. Many areas are sites for recreational uses such as campsites and picnic grounds.

This Valois soil is in capability subclass IIIe.

VaD—Valois gravelly silt loam, 15 to 25 percent slopes. This moderately steep soil is deep and well drained. It is on hilly reglaciated moraines and on hillsides and valley sides. This soil is generally along lower valley sides, and it formed in glacial till mixed with glacial outwash deposits. Areas of this soil are irregular in shape and range from 3 to 50 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of dark grayish brown gravelly silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. It is yellowish brown gravelly silt loam in the upper part, yellowish brown gravelly loam in the middle part, and brown gravelly sandy loam in the lower part. The substratum to a depth of 65 inches or more is grayish brown very gravelly sandy loam.

Included with this soil in mapping are small intermingled areas of the Mardin and Chenango soils. The Mardin soils have a fragipan in the subsoil The Chenango soils formed mainly in glacial outwash deposits and have more than 35 percent gravel in the subsoil. Also included are small areas of the sloping Valois soils and some steep areas. Areas of included soils range from 1/2 acre to 3 acres.

The permeability of this Valois soil is moderate in the surface layer and upper part of the subsoil and moderate or moderately rapid in the lower part of the subsoil and in the substratum. The available water capacity is moderate, and runoff is rapid. Gravel makes up 15 to 35 percent of the surface layer. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and subsoil are very strongly acid to medium acid.

This soil has limited suitability for farming and is poorly suited to most urban uses. Most of the acreage is in woodland, pasture, or hay, or it is idle.

This Valois soil is poorly suited to cultivated crops because of the moderately steep slope and very serious erosion hazard. The operation of farm equipment is somewhat difficult because of slope. If cultivated crops are grown, it should be infrequently, and a maximum of conservation practices should be used. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling across slopes, stripcropping, and including sod crops in the cropping system help maintain good tilth, increase the organic matter content, and control erosion. In some years, droughtiness can hinder crop growth.

This soil is better suited to hay and pasture than to cultivated crops. Overgrazing can restrict plant growth and increase erosion. Proper stocking, rotation of pastures, and yearly mowing are the main management needs. Because this soil is naturally acid, applications of lime improve the growth of most pasture plants.

The potential of this soil for wood crops is good. Seedlings that can withstand acid conditions are best suited to this soil and should be planted early in the spring when the soil is moist. Equipment use is restricted by the moderately steep slopes. Placing logging trails across the slope reduces the hazard of trail gullying.

This soil is not suited to many urban uses because of the moderately steep slopes. Small stones in the surface layer are also a limitation for some uses. Erosion is a problem on construction sites. Revegetating these areas as soon as possible reduces this hazard.

This Valois soil is in capability subclass IVe.

VbA—Varysburg gravelly loam, 0 to 3 percent slopes. This nearly level soil is deep and well drained and moderately well drained. It formed in gravelly deposits that are underlain by clayey sediment. This soil is generally on terraces along lower valley sides and on flat plains. Areas of this soil are oblong or irregular in shape and range from 3 to 20 acres.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 9 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and dark brown very gravelly loam in the upper part and mottled, brown silty clay in the lower part. The substratum to a depth of 60 inches is brown varved silty clay.

Included with this soil in mapping are small areas of the Rhinebeck, Chenango, and Hudson soils. The somewhat poorly drained Rhinebeck soils are on foot slopes and in low spots. The Chenango soils are underlain by clayey deposits at a depth of more than 60 inches, and the Hudson soils do not have a gravelly surface mantle. Areas of included soils range from 1/4 acre to 3 acres.

In April and May this Varysburg soil has a perched seasonal high water table in the lower part of the subsoil. Permeability in the gravelly mantle is moderately rapid or moderate, and in the underlying clayey material it is very slow. The available water capacity is moderate, and runoff is medium to slow. This soil has 15 to 35 percent gravel in the surface layer. Depth to bedrock is generally 5 feet or more. In unlimed areas the surface layer and upper part of the subsoil are strongly acid or medium acid.

This soil is suited to farming and some urban uses. Most areas are cultivated or in hay, pasture, or woodland. A few small areas are urbanized.

This Varysburg soil is moderately well suited to cultivated crops. Midsummer droughtiness, gravel in the surface layer, and temporary seasonal wetness are the main limitations. Gravel and occasional surface stones interfere with some tillage operations and cause excessive wear of machinery. Subsurface drainage of included wet spots improves the use of many fields. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops help maintain good tilth and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity.

This soil is well suited to pasture and hay. Overgrazing should be avoided, because it can cause the loss of the pasture plants. Pasture seedings usually respond well to liberal applications of lime.

The potential of this soil for wood crops is good. Machine planting of tree seedlings is practical in large areas of this soil, although gravel may hinder the planting operations. Planting seedlings early in the spring when the soil is moist helps insure their survival.

This soil has some limitations for urban uses. Basements are difficult to keep dry because of the seasonal high water table, but subsurface drains around foundations and proper grading minimize this problem. Very slow permeability in the underlying clayey material and gravel also limit some uses of this soil. Excavations are subject to slipping or slumping, particularly when the soil is wet. Watering in the dry summer months and liberally applying lime help establish and maintain lawns.

This Varysburg soil is in capability subclass IIw.

VbB—Varysburg gravelly loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained and moderately well drained. It formed in gravelly deposits underlain by clayey sediment. This soil is generally on undulating terraces along lower valley sides. Areas of this soil are oblong or irregular in shape and range from 3 to 20 acres.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 9 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and dark brown very gravelly loam in the upper part and mottled, brown silty clay in the lower part. The substratum to a depth of 60 inches is brown varved silty clay.

Included with this soil in mapping are small areas of the Rhinebeck, Chenango, and Hudson soils. The somewhat poorly drained Rhinebeck soils are on foot slopes and in low spots. The Chenango soils are underlain by clayey deposits at a depth of more than 60 inches, and the Hudson soils do not have a gravelly surface mantle. Areas of included soils range from 1/4 acre to 3 acres.

In April and May this Varysburg soil has a perched seasonal high water table in the lower part of the subsoil. Permeability in the gravelly mantle is moderately rapid or moderate, and in the underlying clayey material it is very slow. The available water capacity is moderate, and runoff is medium. The surface layer is 15 to 35 percent gravel. Depth to bedrock is generally 5 feet or more. In unlimed areas, the surface layer and upper part of the subsoil are strongly acid or medium acid.

This soil is suited to farming and some urban uses. Most areas are cultivated or used for hay, pasture, or woodland. A few small areas are urbanized.

This Varysburg soil is moderately suited to cultivated crops. Midsummer droughtiness, gravel in the surface layer, the erosion hazard, and temporary seasonal wetness are the main limitations. Gravel and occasional surface stones interfere with some tillage operations and cause excessive wear of machinery. Subsurface drainage of included wet spots improves the use of many fields. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling across slopes, plowing at the proper soil moisture content, and rotating crops help maintain good tilth and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity and also helps control erosion.

This soil is well suited to pasture and hay. Overgrazing should be avoided, because it can cause the loss of the pasture plants. Pasture seedings respond well to liberal applications of lime.

The potential of this soil for wood crops is good. Machine planting of tree seedlings is practical in large areas of this soil in spite of the gravel. Planting seedlings early in the spring when the soil is moist helps insure their survival.

This soil has some limitations for urban uses. Basements are difficult to keep dry because of the seasonal high water table. Subsurface drainage of foundations, interceptor drains, and proper grading help minimize this problem. Very slow permeability in the underlying clayey material and gravel are also limitations for some uses. Excavations are subject to slipping or slumping, particularly when the soil is wet. Watering in the dry summer months and liberally applying lime help establish and maintain lawns.

This Varysburg soil is in capability subclass IIe.

VbC—Varysburg gravelly loam, 8 to 15 percent slopes. This sloping soil is deep and well drained and moderately well drained. It formed in gravelly deposits underlain by clayey sediment. This soil is generally on terrace fronts and rolling moraines along lower valley sides. Slopes are convex and range from 100 to 800 feet in length. Areas of this soil are long and narrow or irregular in shape and range from 3 to 40 acres.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 9 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and dark brown very gravelly loam in the upper part and mottled, brown silty clay in the lower part. The substratum to a depth of 60 inches is brown varved silty clay.

Included with this soil in mapping are small areas of the Chenango and Hudson soils. The Chenango soils are underlain by clayey deposits at a depth of more than 60 inches, and the Hudson soils do not have a gravelly surface mantle. Also included are a few areas of soils that are steep or very steep. Areas of included soils range from 1/4 acre to 3 acres.

In April and May this Varysburg soil has a perched seasonal high water table in the lower part of the subsoil. Permeability in the gravelly mantle is moderately rapid or moderate, and in the underlying clayey material it is very slow. The available water capacity is moderate, and runoff is medium. The surface layer is 15 to 35 percent gravel. Depth to bedrock is generally 5 feet or more. In unlimed areas, the surface layer and upper part of the subsoil are strongly acid or medium acid.

This soil is moderately suited to farming and some urban uses. Most of the acreage is cultivated or in hay or pasture. Some areas of this soil are in woodland, and a few small areas are urbanized.

This Varysburg soil is moderately suited to cultivated crops. Erosion hazard, midsummer droughtiness, gravel in the surface layer and temporary seasonal wetness are the main limitations. Gravel and occasional surface stones interfere with some tillage operations and cause excessive wear of machinery. Subsurface drainage of included wet spots improves the use of many fields. Erosion is a serious problem in intensively cultivated areas. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops help maintain good tilth, control erosion, and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity.

This soil is well suited to pasture and hay. Overgrazing when the soil is dry should be avoided, because it can cause the loss of the pasture plants. Pasture seedings respond well to liberal applications of lime.

The potential of this soil for wood crops is good. In spite of the gravel, machine planting of tree seedlings is practical in large areas of this soil. Planting seedlings early in the spring when the soil is moist helps insure their survival.

This soil has some limitations for urban uses. Basements are difficult to keep dry because of the seasonal high water table. Subsurface drains around foundations and proper grading minimize this problem. Gravel and very slow permeability in the underlying clayey material are limitations for some uses. Excavations are subject to slipping or slumping, particularly when the soil is wet. Slope is a limitation for some uses.

This Varysburg soil is in capability subclass IIIe.

VbD—Varysburg gravelly loam, 15 to 25 percent slopes. This moderately steep soil is deep and well drained and moderately well drained. It formed in gravelly deposits underlain by clayey sediment. This soil is in hilly areas where slopes are complex and less than 800 feet long. These areas are irregular in shape. Some areas along the front of terraces are long and narrow. Most areas of this soil range from 3 to 40 acres.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 9 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and dark brown very gravelly loam in the upper part and mottled, brown silty clay in the lower part. The substratum to a depth of 60 inches is brown varved silty clay.

Included with this soil in mapping are small areas of the Rhinebeck, Chenango, and Hudson soils. The somewhat poorly drained Rhinebeck soils are on foot slopes and in low spots. The Chenango soils are underlain by clayey deposits at a depth of more than 60 inches, and the clayey Hudson soils do not have a gravelly surface mantle. Also included are a few areas of the steep Varysburg soil. Seep spots are common near the base of slopes. Areas of included soils range from 1/4 acre to 3 acres.

In April and May this Varysburg soil has a perched seasonal high water table in the lower part of the subsoil and commonly moves laterally downslope. Permeability in the gravelly mantle is moderately rapid or moderate, and in the underlying clayey material it is very slow. The available water capacity is moderate, and runoff is rapid. The surface layer is 15 to 35 percent gravel. Depth to bedrock is generally 5 feet or more. In unlimed areas, the surface layer and upper part of the subsoil are strongly acid or medium acid.

This soil is poorly suited to most farm and urban uses. Most areas are idle or wooded. Some areas are used for pasture or hay.

This Varysburg soil is poorly suited to cultivated crops because of the moderately steep slope, serious erosion hazard, included seep spots, midsummer droughtiness, and gravel in the surface layer. Because the slopes are often complex and in some places dissected, the operation of farm equipment is difficult and the application of conservation practices is not feasible. If cultivated crops are grown, it should be infrequently, and a maximum of conservation practices should be used. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, tilling across slopes, plowing at the proper soil moisture content, stripcropping where practical, and including sod crops in the cropping system control erosion and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity.

This soil can be used for pasture and hay. Overgrazing during wet or dry periods should be avoided, because it can cause the loss of the pasture plants. Reseeding, applying lime and fertilizer, and harvesting hay crops can be difficult because of the moderately steep slopes.

The potential of this soil for wood crops is good. Machine planting of tree seedlings is hindered by slope and by gravel in the surface layer. Placing logging trails across the slope helps prevent trail gullying and erosion. Because this soil tends to be droughty in midsummer, planting seedlings early in the spring helps insure their survival.

The moderately steep slopes, erosion hazard, unstable clayey substratum, temporary seasonal high water table, and included seep spots near the base of slopes are serious limitations for most urban uses of this soil. Very slow permeability in the underlying clayey material and gravel in the surface layer also limit some uses. Excavations in toe slopes can cause massive slips or slumps, particularly when the soil is wet. Reseeding disturbed areas as soon as possible helps prevent erosion and reduces the hazard of slides or slumps. Interceptor drains may be needed to divert excess water from potential slump or slide areas.

This Varysburg soil is in capability subclass IVe.

VbE—Varysburg gravelly loam, 25 to 40 percent slopes. This steep soil is deep and well drained and moderately well drained. It formed in gravelly outwash deposits underlain by clayey sediment. Slopes are often complex or irregular or dissected, and they are generally less than 700 feet long. Most areas are irregular in shape. Some areas along the front of terraces are long and narrow. Areas of this soil range from 3 to 40 acres, but areas of 5 to 15 acres are most common.

Typically, this soil has a surface layer of dark grayish brown gravelly loam about 9 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and dark brown very gravelly loam in the upper part and mottled, brown silty clay in the lower part. The substratum to a depth of 60 inches is brown varved silty clay.

Included with this soil in mapping are small areas of the Rhinebeck, Chenango, and Hudson soils. The somewhat poorly drained Rhinebeck soils are on foot slopes and in low spots. The Chenango soils are underlain by clayey deposits at a depth of more than 60 inches, and the clayey Hudson soils do not have a gravelly surface mantle. The Hudson soils are often in areas where massive slumps have taken place. Also included are seep spots near the base of some slopes. Areas of included soils range from 1/4 acre to 3 acres.

In April and May this Varysburg soil has a perched seasonal high water table above firm layers in the lower part of the subsoil, and the free water commonly moves laterally downslope. Permeability in the gravelly mantle is moderately rapid or moderate, and in the underlying clayey material it is very slow. The available water capacity is moderate, but this soil tends to be more droughty than the less sloping Varysburg soils. Runoff is rapid to very rapid. The surface layer is 15 to 35 percent gravel. Depth to bedrock is generally 5 feet or more. In unlimed areas, the surface layer and upper part of the subsoil are strongly acid or medium acid.

This soil is not suited to most farm and urban uses. Most areas are idle or wooded. A few areas are used for permanent pasture.

This Varysburg soil is not suited to cultivated crops or hay crops because of the steep slope. Because of slope, the operation of farm equipment is very difficult and hazardous. Erosion is a very serious problem in areas that have been cleared of vegetation. Some areas can be used for permanent pasture, but reseeding and applying fertilizers can be very difficult because of slope. Pastures are often of poor quality because this soil is droughty in midsummer. Overgrazing during wet or dry periods should be avoided, because it leads to the loss of the pasture plants and causes erosion and gullying. Restricting grazing during wet or dry periods is the main management requirement.

The potential of this soil for wood crops is fair to good. The steep slopes limit the use of the planting equipment. Placing logging trails across the slope as much as possible helps prevent trail gullying and erosion. Because this soil tends to be droughty in midsummer, planting seedlings early in the spring helps insure their survival.

The steep slopes, erosion hazard, unstable clayey substratum, and seep spots near the base of slopes are very severe limitations for most urban uses of this soil. Excavations on toe slopes are hazardous, because they can lead to massive slips or slumps. Reseeding disturbed areas as soon as possible helps prevent erosion and reduces the hazard of slides or slumps. Interceptor drains also help divert excess water from the potential slump or slide areas.

This Varysburg soil is in capability subclass VIe.

VoA—Volusia silt loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in glacial till deposits. This soil is on moderately low, nearly flat till plains on the upland plateau. Runoff is received from higher adjacent soils. The subsoil is a very dense and compact fragipan. Most areas of this soil are irregular in shape and range from 3 to 50 acres.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsurface layer, about 6 inches thick, is mottled, light brownish gray silt loam. The subsoil extends to a depth of 50 inches. It is a fragipan of mottled, olive brown channery loam. The substratum to a depth of 60 inches is mottled, dark grayish brown very channery loam.

Included with this soil in mapping are small intermingled areas of the Chippewa and Erie soils. The poorly drained Chippewa soils are in depressions and along some drainageways. The Erie soils have an accumulation of clay in the subsoil and are not as acid as this Volusia soil. Also included are small areas of the Volusia soils that have a channery silt loam surface layer and small areas that are gently sloping. A few areas have a silty mantle as much as 25 inches thick. Areas of included soils range up to 3 acres.

From December through May this Volusia soil has a perched seasonal high water table above a dense fragipan layer in the upper part of the soil. Permeability is moderate above the fragipan and slow or very slow in the fragipan and substratum. The available water capacity is low, but in most years there is sufficient moisture to sustain plant growth. Runoff is medium to slow. Depth to bedrock is 5 feet or more. Flat channery fragments make up 5 to 15 percent of the surface layer. In unlimed areas, the surface layer and subsurface layer are very strongly acid to slightly acid.

This soil has limited suitability for farming and urban uses because of seasonal wetness. Most of the acreage is in hay, pasture, or woodland, or it is idle. Some areas of this soil are in cultivated crops.

This Volusia soil is poorly suited to many cultivated crops, unless drained. Seasonal wetness is the main limitation to crop production. Wetness can be overcome by installing drainage where outlets are available; however, locating outlets is difficult on this nearly level soil. Drains generally need to be closely spaced to be effective in the slowly permeable subsoil. Interceptor drains can be used to divert runoff and seepage from the higher adjacent soils. The fragipan restricts rooting depth, and droughtiness is a limitation to crop production in some years. In drained areas that are suitable for cultivating, keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and including sod crops in the cropping system help maintain good tilth and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity.

In undrained areas, this soil is only moderately suited to hay and pasture. With partial drainage, higher yields of these forage crops can be expected. Forage plants that can withstand seasonal wetness are best suited to this soil. Grazing should be deferred when the soil is wet to avoid trampling of the pasture seeding and compacting and puddling the soil, which can result in reduced forage growth.

The potential of this soil for wood crops is fair. A substantial acreage is wooded. Machine planting of tree seedlings is practical on large areas of this soil, but seasonal wetness limits the use of equipment. Seedling mortality and uprooting of trees during windstorms can occur because the soil is seasonally wet and rooting depth is restricted by the dense fragipan. Trees that can withstand seasonal wetness are best suited to this soil.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for many urban uses of this soil. The perched water table may cause basements to be seasonally wet. Drainage around foundations and proper grading of sites can alleviate this problem. The high risk of frost damage is a problem for maintaining roads, parking lots, and structures without basements. Some areas of this soil are excellent sites for dugout ponds.

This Volusia soil is in capability subclass IIIw.

VoB—Volusia silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in acid glacial till deposits. This soil is on concave foot slopes and in other areas of the upland plateau that commonly receive seepage or runoff water from higher adjacent soils. The subsoil is a very dense and compact fragipan. Areas of this soil are oblong or irregular in shape and range from 3 to 50 acres.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsurface layer, about 6 inches thick, is mottled, light brownish gray silt loam. The subsoil extends to a depth of 50 inches. It is a fraigpan of mottled, olive brown channery loam. The substratum to a depth of 60 inches is mottled, dark grayish brown very channery loam.

Included with this soil in mapping are small intermingled areas of the Mardin, Chippewa, and Erie soils. The Mardin soils are moderately well drained and are on a few small, slightly convex knolls. The poorly drained Chippewa soils are in depressions and along some drainageways. The Erie soils have an accumulation of clay in the subsoil and are not as acid as this Volusia soil. Also included are small areas of the Volusia soils that have a channery silt loam surface layer, a few areas that are nearly level, and some areas where the silt mantle is about 25 inches thick. Areas of included soils range up to 3 acres.

From December through May this Volusia soil has a perched seasonal high water table above a dense fragipan layer in the upper part of the soil. Permeability is moderate above the fragipan and slow or very slow in the fragipan and substratum. The available water capacity is low, but in most years there is sufficient moisture to sustain plant growth. Runoff is medium. Depth to bedrock is 5 feet or more. Flat channery fragments make up 5 to 15 percent of the surface layer. In unlimed areas, the surface layer and subsurface layer are very strongly acid to slightly acid.

This soil has limited suitability for farming and urban uses because it is seasonally wet. Most of the acreage is in hay, pasture, woodland, or it is idle. A small acreage is cultivated.

Unless drained, this Volusia soil is poorly suited to many cultivated crops. Seasonal wetness and erosion hazard are the main soil problems, or limitations. Wetness can be overcome by installing appropriate drainage systems. Interceptor drains can be used to divert runoff water and seepage from adjacent higher soils. Subsurface drains need to be closely spaced to be effective in the slowly permeable fragipan. This soil is easier to drain than the nearly level Volusia soils because of slope gradient and the availability of outlets. The fragipan restricts rooting depth, and droughtiness limits crop yields in some years. Erosion is a hazard on long slopes and in intensively cultivated areas. In drained areas that are suitable for cultivation, keeping tillage to a minimum, using cover crops, tilling on the contour, incorporating crop residues into the soil, plowing at the proper soil moisture level, and including sod crops in the cropping system, help maintain good tilth, reduce the erosion hazard, and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity.

The soil is moderately suited to hay and pasture. With partial drainage, higher yields of forage crops can be expected. In undrained areas, forage plants that can withstand seasonal wetness are best suited to this soil. Grazing should be deferred when the soil is wet to avoid trampling of the pasture seeding and compacting and puddling of the soil, which can result in reduced forage growth.

The potential of this soil for wood crops is fair. A substantial acreage is wooded. Machine planting of tree seedlings is practical in large areas of this soil, but seasonal wetness limits the use of equipment. Seedling mortality and uprooting of trees during windstorms can occur because the soil is seasonally wet and rooting depth is restricted by the dense fragipan. Placing logging trails across the slope reduces the hazard of trail gullying. Trees that can withstand seasonal wetness are best suited to this soil.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for many urban uses of this soil. The perched water table may cause basements to be seasonally wet. Drains around foundations, interceptor drains, and proper grading of sites help alleviate this problem. The high risk of frost damage is a problem for maintaining roads, parking lots, and structures without basements. Some areas of this soil are excellent sites for diked ponds.

This Volusia soil is in capability subclass IIIw.

VpA—Volusia channery silt loam, 0 to 3 percent slopes. This nearly level soil is deep and somewhat poorly drained. It formed in glacial till deposits. This soil is on nearly flat till plains on the upland plateau. Surface water is removed slowly from this soil, and runoff is received from adjacent soils. The subsoil is very dense and compact. Areas of this soil are oblong or irregular in shape and range from 3 to 200 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown channery silt loam about 9 inches thick. The subsurface layer is about 6 inches of mottled, light brownish gray channery silt loam. The subsoil extends to a depth of 50 inches. It is a fragipan of mottled, olive brown channery loam. The substratum to a depth of 60 inches is mottled, dark grayish brown very channery loam.

Included with this soil in mapping are small intermingled areas of the Mardin, Chippewa, and Erie soils. The Mardin soils are moderately well drained and are on the slightly higher rises or knolls. The poorly drained Chippewa soils are in depressions and along drainageways. The Erie soils have an accumulation of clay in the subsoil, and reaction is not as acid. Also included are small areas of the Volusia soils that have a silt loam surface layer. Areas of included soils range up to 3 acres.

From December through May this Volusia soil has a perched seasonal high water table above the dense fragipan in the upper part of the soil. Permeability is moderate above the fragipan and slow or very slow in the fragipan and substratum. The available water capacity is low, but in most years there is sufficient moisture to sustain plant growth. Runoff is medium to slow. Depth to bedrock is 5 feet or more. Flat channery fragments make up 15 to 30 percent of the surface layer. In unlimed areas, the surface layer and subsurface layer are very strongly acid to slightly acid.

This soil has limited suitability for farming and urban uses because it is seasonally wet. Most areas are in woodland, hay, or pasture, or they are idle. A few areas are in residential uses, and some areas are cultivated.

This Volusia soil is poorly suited to many cultivated crops. Seasonal wetness and small stones are the main limitations. In order to get satisfactory yields, drainage is usually necessary. Wetness can be overcome by installing drainage where outlets are available; however, outlets are hard to locate in many areas. Drains usually need to be closely spaced to be effective in the slowly permeable subsoil. Small stones on the surface interfere with the cultivation of some crops and cause excessive wear of machinery. In drained areas and areas suitable for farming, keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain good tilth and increase organic matter content of the soil. Increasing the organic matter content improves the available water capacity.

The soil is moderately suited to hay and pasture. With partial drainage, higher yields of these forage crops can be expected. In undrained areas, forage plants that can withstand seasonal wetness are best suited to this soil. Grazing should be deferred when the soil is wet to avoid trampling of the pasture seeding and the compacting and puddling of the soil, which can result in restricted plant growth.

The potential of this soil for wood crops is fair. A substantial acreage is wooded. Machine planting of tree seedlings is practical in large areas of this soil, but seasonal wetness and small stones limit the use of equipment. The erosion hazard is slight. Seedling mortality and uprooting of trees during windstorms can occur because the soil is seasonally wet and rooting depth is restricted by the dense fragipan. Trees that can withstand seasonal wetness are best suited to this soil.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for many urban uses of this soil. The perched water table can cause basements to be seasonally wet. Drainage around foundations and proper grading of sites can alleviate this problem. Small stones are bothersome for establishing lawns. The high risk of frost damage is a problem for maintaining roads, parking lots, and structures without basements. Some areas of this soil are excellent sites for ponds.

This Volusia soil is in capability subclass IIIw.

VpB—Volusia channery silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and somewhat poorly drained. It formed in acid glacial till deposits. This soil is on foot slopes and other areas of the upland plateau that commonly receive seepage or runoff from higher adjacent soils. The subsoil is very dense and compact. Areas of this soil are oblong or irregular in shape and range from 3 to 200 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown channery silt loam about 9 inches thick. The subsurface layer is about 6 inches of mottled, light brownish gray channery silt loam. The subsoil extends to a depth of 50 inches. It is a fragipan of mottled, olive brown channery loam. The substratum to a depth of 60 inches is mottled, dark grayish brown very channery loam.

Included with this soil in mapping are small intermingled areas of the Mardin, Chippewa, and Erie soils. The Mardin soils are moderately well drained and are intermingled with this Volusia soil on small, slightly convex knolls. The poorly drained Chippewa soils are in depressions and along drainageways. The Erie soils have an accumulation of clay in the subsoil and are not as acid as this Volusia soil. Also included are small areas of the Volusia soils that have a silt loam surface layer without channery fragments. Areas of included soils range up to 3 acres.

From December through May this Volusia soil has a perched seasonal high water table above the dense fragipan in the upper part of the soil. Permeability is moderate above the fragipan and slow or very slow in the fragipan and substratum. The available water capacity is low, but in most years there is sufficient moisture to sustain plant growth. Runoff is medium. Depth to bedrock is 5 feet or more. Flat channery fragments make up 15 to 30 percent of the surface layer. In unlimed areas, the surface layer and subsurface layer are very strongly acid to slightly acid.

This soil has limited suitability for farming and urban uses because it is seasonally wet. Most areas are in woodland, hay, or pasture, or they are idle. A few areas are in residential uses, and some areas are cultivated.

This Volusia soil is poorly suited to many cultivated crops. Seasonal wetness, erosion hazard, and small stones are the main limitations. In order to get satisfactory yields, drainage is generally necessary. Interceptor drains can be used to divert runoff and seepage from adjacent higher soils. Subsurface drains need to be closely spaced to be effective in the slowly permeable subsoil. This soil is easier to drain than the nearly level Volusia soils. Small stones on the surface interfere with the cultivation of some crops and cause excessive wear of machinery. Erosion is a hazard on long slopes and in intensively cultivated areas. In drained areas and areas suitable for farming, keeping tillage to a minimum, using cover crops, tilling on the contour, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain good tilth, reduce the erosion hazard, and increase the organic matter content of the soil. Increasing the organic matter content improves the available water capacity.

The soil is moderately suited to hay and pasture. With partial drainage, higher yields of forage crops can be expected. In undrained areas, forage plants that can withstand seasonal wetness are best suited to this soil. Grazing should be deferred when the soil is wet to avoid trampling of the pasture seeding and the compacting and puddling of the soil which result in restricted plant growth.

The potential of this soil for wood crops is fair. A substantial acreage is wooded. Machine planting of tree seedlings is practical in large areas of this soil, but seasonal wetness and small stones limit the use of equipment. Seedling mortality and uprooting of trees during windstorms can occur because the soil is seasonally wet and rooting depth is restricted by the dense fragipan. Trees that can withstand seasonal wetness are best suited to this soil.

Seasonal wetness and slow or very slow permeability in the fragipan are serious limitations for many urban uses of this soil. The perched water table can cause basements to be seasonally wet. Drainage around foundations, interceptor drains, and proper grading of sites help alleviate this problem. Small stones are bothersome for establishing lawns. The high risk of frost damage is also a problem for maintaining roads, parking lots, and structures without basements. Some areas are excellent sites for diked ponds.

This Volusia soil is in capability subclass IIIw.

WaA—Wassaic silt loam, 0 to 3 percent slopes. This nearly level soil is moderately deep and well drained to moderately well drained. It formed in a thin mantle of glacial till deposits. This soil is in nearly flat areas of glacial till plains underlain by bedrock at a depth of 20 to 40 inches. Areas of this soil are oblong or irregular in shape, and range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown silt loam 9 inches thick. The subsurface layer is about 1 inch of grayish brown loam. The subsoil extends to a depth of 23 inches. It is brown silt loam in the upper part and gravelly silt loam in the lower part. The substratum is brown gravelly loam. Hard limestone bedrock is at a depth of 28 inches.

Included with this soil in mapping are small intermingled areas of the Newstead, Farmington, Honeoye, and Lima soils. The Newstead soils are somewhat poorly drained and are in slight depressions. The Farmington soils are shallow over bedrock. The well drained Honeoye soils and the moderately well drained Lima soils are underlain by bedrock at a depth of more than 5 feet. Also included are a few areas where bedrock outcrops at the surface. Areas of included soils range up to 3 acres, and rock outcroppings cover less than one-quarter acre.

In March and April this soil has a perched seasonal high water table above the bedrock in some areas. Permeability is moderate or moderately slow in the subsoil. The available water capacity is low to moderate, and runoff is slow to medium. Gravel makes up 0 to 15 percent of the surface layer. In unlimed areas, the surface layer and subsoil range from medium acid to neutral.

This soil is suitable for farming but has serious limitations for some urban uses. Most areas are farmed. Some areas are in residential or commercial developments.

This Wassaic soil is suited to cultivated crops. The seasonal high water table can temporarily delay planting of early-season crops. Drainage of wet spots is difficult because of the underlying hard bedrock. Occasional surface stones and rock outcrops interfere with tillage. Keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth and improve the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. Droughtiness is a problem in some years. This soil is easier to till than the gently sloping Wassaic soil.

This soil is well suited to pasture and hay. Overgrazing is a hazard because it reduces plant growth and can lead to the loss of the pasture plants. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing early in the spring when the soil is wet are the chief management needs.

The potential of this soil for wood crops is good. The erosion hazard, equipment limitation, seedling mortality, and windthrow hazard are generally not problems on this soil. Plant competition will delay, but not prevent, natural or artificial regeneration of hardwoods; but competition will prevent natural or artificial regeneration of conifers. Large areas are suitable for machine planting of tree seedlings.

The moderate depth to limestone bedrock and the temporary seasonal high water table are serious limitations for some urban uses of this soil. Where the soil is used for septic tank absorption fields, contamination of the ground water is a hazard because of the jointed and fractured limestone bedrock. The bedrock is so hard that it cannot be excavated with a backhoe; therefore, underground installations are very difficult and costly. Lawns and shrubs need watering in midsummer because the soils tend to be droughty in some years.

This Wassaic soil is in capability subclass IIs.

WaB—Wassaic silt loam, 3 to 8 percent slopes. This gently sloping soil is moderately deep and well drained to moderately well drained. It formed in a thin mantle of glacial till deposits on undulating glacial till plains underlain by bedrock at a depth of 20 to 40 inches. Areas of this soil are oblong or irregular in shape and range from 3 to 100 acres, but areas of 5 to 50 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown silt loam 9 inches thick. The subsurface layer is about 1 inch of grayish brown loam. The subsoil extends to a depth of 23 inches. It is brown silt loam in the upper part and gravelly silt loam in the lower part. The substratum is brown gravelly loam. Hard limestone bedrock is at a depth of 28 inches.

Included with this soil in mapping are small intermingled areas of the Newstead, Farmington, Honeoye, and Lima soils. The Newstead soils are somewhat poorly drained and are in nearly flat or slightly depressed areas. The Farmington soils are shallow over bedrock. The well drained Honeoye and moderately well drained Lima soils are underlain by bedrock at a depth of more than 5 feet. Also included are a few areas where bedrock outcrops at the surface. Areas of included soils range up to 3 acres, and rock outcroppings cover less than one-quarter acre.

In March and April this Wassaic soil has a perched seasonal high water table above the bedrock in some areas. Permeability is moderate or moderately slow in the subsoil. The available water capacity is low to moderate, and runoff is medium. Gravel makes up 0 to 15 percent of the surface layer. In unlimed areas, the surface layer and subsoil range from medium acid to neutral.

This soil is suitable for farming but has serious limitations for some urban uses. Most areas are farmed or wooded. A few areas are in residential developments.

This Wassaic soil is suited to cultivated crops. The seasonal high water table can temporarily delay planting of early-season crops. Erosion is a moderate hazard in intensively cultivated areas. Drainage of wet spots is difficult because of the underlying hard bedrock. Occasional surface stones and rock outcrops interfere with tillage. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, plowing at the proper soil moisture level, and rotating crops help maintain tilth and improve the organic matter content of the soil. Increasing the organic matter content improves the available water capacity. Droughtiness is a problem in some years.

This soil is well suited to pasture and hay. Overgrazing is a hazard because it reduces plant growth and can lead to the loss of the pasture plants. Erosion is a problem in overgrazed areas. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing early in the spring when the soil is wet are the chief management needs.

The potential of this soil for wood crops is good. The erosion hazard, equipment limitation, seedling mortality, and windthrow hazard are generally not problems on this soil. Plant competition will delay, but not prevent, natural or artificial regeneration of hardwoods; but competition will prevent natural or artificial regeneration of conifers. Large areas are suitable for machine planting of tree seedlings.

The moderate depth to limestone bedrock and the temporary seasonal high water table are serious limitations for some urban uses of this soil. Where the soil is used for septic tank absorption fields, contamination of the ground water is a hazard because of the jointed and fractured limestone bedrock. The bedrock is so hard that it cannot be excavated with a backhoe, which makes underground installation very difficult. Lawns and shrubs need watering in midsummer because the soils tend to be droughty in some years.

This Wassaic soil is in capability subclass IIe.

WbB—Wassaic very stony loam, 3 to 8 percent slopes. This gently sloping soil is moderately deep and well drained to moderately well drained. It formed in a thin mantle of glacial till deposits. This soil is on undulating glacial till plains underlain by limestone bedrock at a depth of 20 to 40 inches. Stones and boulders more than 10 inches in diameter are 5 to 30 feet apart on the surface. Areas are oblong or irregular in shape and range from 3 to 50 acres, but areas of 5 to 20 acres are most common.

Typically, this soil has a surface layer of very dark grayish brown loam 9 inches thick. The subsurface layer is about 1 inch of grayish brown loam. The subsoil extends to a depth of 10 to 23 inches. It is brown silt loam in the upper part and gravelly silt loam in the lower part. The substratum is brown gravelly loam. Hard limestone bedrock is at a depth of 28 inches.

Included with this soil in mapping are small intermingled areas of the Newstead, Farmington, Honeoye, and Lima soils. The Newstead soils are somewhat poorly drained and are in nearly flat or slightly depressed areas. The Farmington soils are shallow over bedrock. The well drained Honeoye and moderately well drained Lima soils are underlain by bedrock at a depth of more than 5 feet. Also included are a few areas where bedrock outcrops at the surface. Areas of included soils range up to 3 acres, and rock outcroppings cover less than one-quarter acre.

In March and April this Wassaic soil has a perched seasonal high water table above the bedrock in some areas. Permeability is moderate or moderately slow in the subsoil. The available water capacity is low to moderate, and runoff is medium. In addition to large stones on the surface, gravel makes up 0 to 15 percent of the surface layer. In unlimed areas, the surface layer and subsoil range from medium acid to neutral.

The soil is not suitable for farming because of the large stones on the surface, and it also has serious limitations for urban uses. Most of the acreage is idle or in woodland. A small acreage is in residential or commercial developments.

This Wassaic soil is not suitable for cultivated crops because large stones on the surface make the operation of modern farm equipment extremely difficult and hazardous. The temporary seasonal wetness, water erosion hazard, restricted rooting depth, restricted available moisture capacity, and occasional included areas of rock outcrop also limit crop production. These limitations need to be considered in determining the feasibility of clearing away stones in order to plant cultivated crops or hay. If areas are cleared, tilling across slopes, using cover crops, keeping tillage to a minimum, stripcropping, and including sod crops in the cropping system help to control erosion, improve good tilth, and increase the organic matter content.

Although this soil can be used for permanent pasture, the large surface stones make reseeding and applying lime and fertilizer difficult. Proper stocking, rotational grazing, and restricted grazing when the soils are wet early in the spring help maintain the pasture grasses.

The potential of this soil for wood crops is good. The erosion hazard, seedling mortality, and windthrow hazard are generally not problems on this soil. Plant competition will delay, but not prevent, natural or artificial regeneration of hardwoods; but competition will prevent natural or artificial regeneration of conifers. Hand planting of seedlings is generally required because of the large stones.

The moderate depth to limestone bedrock, large stones on the surface, and the temporary seasonal high water table are serious limitations for many urban uses of this soil. Where the soil is used for septic tank absorption fields, contamination of the ground water is a hazard because of the jointed and fractured limestone bedrock. The bedrock is so hard that it cannot be excavated with a backhoe; therefore, underground installations are very difficult. Lawns and shrubs need watering in midsummer because the soils tend to be droughty in some years.

This Wassaic soil is in capability subclass VIs.

WcE—Wassaic-Rock outcrop complex, 25 to 40 percent slopes. This complex consists of steep, well drained to moderately well drained Wassaic soils and outcroppings of bedrock. The Wassaic soils formed in a thin mantle of loamy glacial till underlain by limestone bedrock at a depth of 20 to 40 inches. This complex is along the front of the major limestone escarpment that crosses the county in an east-west direction. The surface layer texture of the Wassaic soils is gravelly silt loam, gravelly fine sandy loam, and gravelly loam. Areas of this complex are mostly long and narrow and range from 3 to 50 acres, but areas of 5 to 20 acres are most common.

This complex is about 65 percent Wassaic soils, 25 percent Rock outcrop, and 10 percent other soils. The Wassaic soil and the limestone Rock outcrop occur in such an intricate pattern that they were not separated in mapping.

Typically, the Wassaic soils have a surface layer of very dark grayish brown gravelly silt loam 9 inches thick. The subsurface layer is grayish brown loam 1 inch thick. The subsoil extends to a depth of 23 inches. It is brown silt loam in the upper part and gravelly silt loam in the lower part. The substratum is brown gravelly loam. Hard limestone bedrock is at a depth of 28 inches.

Typically, the Rock outcrop is gray hard limestone. It protrudes at the surface as ledges and angular blocks of rock.

Included in mapping are intermingled areas of the shallow Farmington and Benson soils and a soil that is less than 10 inches deep to bedrock. Also included are areas of colluvial silt and clay from adjacent associated soils. Talus piles of rock rubble are at the base of some slopes. Areas of included soils range up to 3 acres.

In March and April the Wassaic soils have a temporary perched seasonal high water table above the bedrock in some places. Permeability is moderate or moderately slow in the subsoil. The available water capacity is low to moderate, and runoff is rapid to very rapid. Gravel makes up 15 to 35 percent of the surface layer, and bedrock is at a depth of 20 to 40 inches. The surface layer and subsoil range from medium acid to neutral.

The steep slopes, moderate depth to bedrock, and outcrops of rock make this complex unsuitable for farming or urban uses. Most of the acreage is idle or in woodland.

Because it has steep slopes, bedrock at a depth of 20 to 40 inches, occasional large stones on the surface, and areas of Rock outcrop, this complex is not suited to cultivated crops, hay, or improved pasture. Some areas can be used for unimproved pasture. Fertilizing, liming, and reseeding are very difficult because of the limitations. Droughtiness limits pasture growth in midsummer.

The potential of this complex for wood crops is poor to good depending on soil depth. Use of equipment is seriously restricted by steep slopes and ledgy rock outcrops. Placing logging trails across the slope helps eliminate any hazard of trail gullying. Trees that can withstand midsummer droughtiness are best suited to this complex.

Steep slopes, depth to bedrock, and ledgy rock outcroppings are very serious limitations for all types of urban uses. Some areas are suitable for the improvement of woodland wildlife habitat.

This Wassaic-Rock outcrop complex is in capability subclass VIIs.

Wd—Wayland silt loam. This nearly level soil is deep and poorly drained and very poorly drained. It formed in silty alluvium on the lowest parts of flood plains. Areas of this soil are mostly oblong and parallel the adjacent stream. They range from 3 to 100 acres, but areas of 5 to 50 acres are most common. Slope ranges from 0 to 3 percent.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 28 inches. It is mottled, dark gray silt loam. The substratum is mottled, dark gray silt loam in the upper part and is dark gray to dark grayish brown stratified silt loam and very fine sand to a depth of 55 inches.

Included with this soil in mapping are small intermingled areas of the Teel and Middlebury soils. The Teel soils are on higher parts of the flood plain and have less clay in the subsoil than this Wayland soil. The Middlebury soils are also on higher parts of the flood plain and are underlain by sand and gravel. Also included are soils that have a mucky surface layer and soils that are underlain by sand and gravel at a depth of less than 36 inches. Areas of included soils range from 1/4 acre to 3 acres.

This Wayland soil has a high water table at or very near the soil surface from November through June. The water table is partly controlled by the nearby stream. Flooding is common, particularly in the spring and other periods of heavy runoff. Permeability is moderately slow or moderate in the surface layer and slow in the subsoil and substratum. The available water capacity is high, and runoff is slow to occasionally ponded. Depth to bedrock is generally 5 feet or more. This soil is generally free of stones and gravel. The surface layer is strongly acid to mildly alkaline.

Frequent flooding and prolonged wetness are serious limitations for farm and urban uses of this soil. Most areas are idle and support wetness-tolerant brush and grasses. Some areas are used for pasture.

This Wayland soil is poorly suited to most crops because of the prolonged high water table and hazard of flooding. Drainage is generally difficult because there are few suitable outlets. Where it can be drained, this gravel-free soil is suitable for many crops. In drained areas, keeping tillage to a minimum, using cover crops, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops help maintain the high organic matter level and good tilth. Sod crops and cover crops also protect the surface from scouring by floodwaters.

In undrained areas, this soil has limited suitability for pasture. Pasture grasses that can withstand prolonged wetness are the most desirable. Restricting grazing when the soil is wet is essential to prevent soil compaction and trampling of the pasture grasses.

The potential of this soil for wood crops is poor. Frequent flooding and the prolonged high water table that is at or near the surface limit the use of equipment and cause a high rate of seedling mortality. Seedlings that are suited to wet soil conditions are the most desirable. Erosion is usually not a hazard, but scouring is a hazard when the stream overflows.

Frequent flooding, prolonged wetness, and high risk of frost damage are very serious limitations for most urban and recreational uses of this soil. Areas around urban centers serve as natural open-space corridors and are suited to this purpose. Some areas have good potential for the development of wetland wildlife habitat.

This Wayland soil is in capability subclass Vw.

WeB—Williamson silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It formed in silty, stone-free deposits. This soil is on convex knolls and ridges. Some areas are dissected by intermittent streams. Areas of this soil range from 3 to 20 acres, but areas of 5 to 10 acres are most common.

Typically, this soil has a surface layer of dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 45 inches. It is dark yellowish brown silt loam in the upper part; is mottled, pale brown silt loam in the middled part; and is a dense fragipan of brown and yellowish brown very fine sandy loam in the lower part. The substratum is yellowish brown silt loam in the upper part and brown loamy very fine sand in the lower part.

Included with this soil in mapping are small intermingled areas of the Arkport and Collamer soils. The Arkport soils have a high sand content and lack the fragipan that is in this Williamson soil. The Collamer soils have a high clay content and also do not have a fragipan. Also included is a soil on foot slopes that is similar to this Williamson soil but not as well drained. Areas of included soils range up to 3 acres.

From February through May this Williamson soil has a perched seasonal high water table above the dense fragipan in the lower part of the subsoil. Permeability is moderate in the surface layer and upper part of the subsoil and slow in the fragipan and substratum. The available water capacity is moderate to high, and runoff is medium to rapid. There are generally no gravel and stones in the soil. Bedrock is at a depth of more than 5 feet. In unlimed areas the surface layer and subsoil are medium acid to very strongly acid.

This soil is suited to farming but has limitations for many urban uses. Most areas are farmed or in woodland. Some areas are idle.

This gravel-free Williamson soil is suited to cultivated crops, including some vegetable crops. Drainage may be needed in areas that have included wetter soils. Erosion control is often needed to protect the topsoil and control runoff. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, plowing at the proper soil moisture content, and rotating crops help maintain tilth, improve the organic matter content, and minimize the erosion hazard. Liberal applications of lime are needed for many crops.

This soil is well suited to hay and pasture; however, overgrazing can lead to the loss of the pasture seeding and cause erosion. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the main management needs.

The potential of this soil for wood crops is good. The use of equipment is not limited on this soil, and seedling mortality is low. Placing logging trails across the slope minimizes the hazard of erosion and trail gullying. Trees that can withstand acid conditions are best suited to this soil.

The slow permeability in the fragipan and substratum, temporary seasonal wetness, and high risk of frost damage limit many urban uses of this soil. Surface runoff needs to be controlled during construction because the soil is erosive. Sidewalls of excavations tend to slump and erode, particularly when the soil is wet. Frost heaving is a serious problem for roads and parking lots built on this soil.

This Williamson soil is in capability subclass IIe.

WeC—Williamson silt loam, 8 to 15 percent slopes. This sloping soil is deep and moderately well drained. It formed in silty, gravel-free sediments. This soil is on convex knolls and the sides of ridges and terraces. Some areas are on the side slopes of dissecting gullies. The areas range from 3 to 20 acres and are often oblong. Some areas are long and very narrow.

Typically, this soil has a surface layer of dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 45 inches. It is dark yellowish brown silt loam in the upper part; is mottled, pale brown silt loam in the middle part; and is a dense fragipan of brown and yellowish brown very fine sandy loam in the lower part. The substratum to a depth of 60 inches is yellowish brown silt loam in the upper part and brown loamy very fine sand in the lower part.

Included with this soil in mapping are small intermingled areas of the Collamer and Scio soils. The Collamer soils have a high clay content in the subsoil and lack a fragipan. The Scio soils have gravel in the substratum. Also included in mapping, on foot slopes and in depressions, is a soil similar to this Williamson soil but not as well drained. Areas of included soils range up to 3 acres.

From February through April this Williamson soil has a perched seasonal high water table above the dense fragipan in the lower part of the subsoil. Permeability is moderate in the surface layer and upper part of the subsoil and slow in the fragipan and substratum. The available water capacity is moderate to high, and runoff is rapid. There are generally no gravel and stones in the soil. Bedrock is at a depth of more than 5 feet. In unlimed areas, the surface layer and subsoil are very strongly acid to medium acid.

This soil is suited to farming but has limitations for many urban uses. Most areas are farmed or in woodland. Some areas are idle.

This gravel-free soil is moderately suited to cultivated crops. Drainage may be needed in areas that have included wet spots. Erosion is a very serious hazard on this silty soil. Keeping tillage to a minimum, using cover crops, tilling across slopes, incorporating crop residues into the soil, stripcropping, terracing, plowing at the proper soil moisture content, and rotating crops help maintain tilth, improve the organic matter content, and control erosion and surface runoff. Liberal applications of lime are needed for many crops.

This soil is suited to hay and pasture; however, overgrazing can cause the loss of the pasture seeding and increase the hazard of erosion. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the main management needs.

The potential of this soil for wood crops is good. The use of equipment is not limited on this soil, and seedling mortality is low. Placing logging trails across the slope minimizes the hazard of erosion and trail gullying. Trees that can withstand acid conditions are best suited to this soil.

The slow permeability in the fragipan and substratum, temporary seasonal wetness, slope, and high risk of frost damage are serious limitations for many urban uses of this soil. Surface runoff needs to be controlled during construction because the soil is erosive. Sidewalls of excavations tend to slump and cave, particularly when the soil is wet. If cuts are made in foot slopes, the soil tends to slip or slide. Frost heaving is a serious problem for roads and parking lots.

This Williamson soil is in capability subclass 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

Edward Rutkowski and Bruce Tillapaugh, extension specialists, Cooperative Extension Service, and Douglas Dettenrieder, district conservationist, Soil Conservation Service, assisted in developing the yield tables for this section. Dr. Shaw Reid, Cornell University Agronomy Department, assisted in the review of this section.

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

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

general principles of soil management

More than 175,000 acres in Erie County was used for crops and pasture in 1974, according to the Census of Agriculture (*12*). Of this total, 47,000 acres was used for pasture; and 128,000 acres was used for crops, mostly hay, corn, small grains, and vegetable crops. The potential of the soils for increased crop production is excellent in certain sections of the county. About 21,000 acres of potentially good cropland is currently used for pasture, and another 34,000 acres is wooded. In addition to the reserve productive capacity represented by these lands, crop yields can be increased by applying the latest crop production technology and appropriate soil conservation practices to all cropland in the county. 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 recreational purposes. The use of the soil survey to make land use decisions that affect farming in the county is discussed in other sections of "Use and Management of the Soils" and in the section titled "Detailed soil map units." Some general principles of soil management related to crop production in Erie County follow.

Soil erosion is a major or potential problem on about one-quarter of the cropland in Erie County according to the 1967 New York State Inventory of Soil and Water Conservation Needs (*8*). The hazard of erosion is related to the slope and erodibility of the soil, the amount and intensity of rainfall, and the type of vegetative cover.

Where soil is lost through erosion, soil nutrients are lost, gullies form on hillsides, tilth deteriorates, sedimentation occurs downslope, and nearby streams and reservoirs are polluted. Soil productivity is reduced if the surface layer is lost and an increasing amount of the subsoil is incorporated into the plow layer. This is especially true of soils that have a fine or moderately fine textured subsoil, such as the Schoharie and Rhinebeck soils, and of soils that have a compacted subsoil that restricts rooting depth, such as the Mardin and Erie soils. Erosion also reduces the productivity of soils that tend to be droughty, such as the Blasdell and Alton soils, by reducing their organic matter content. Soils that are shallow or moderately deep to bedrock, such as the Farmington or Manlius soils, are permanently damaged by erosion.

Erosion can be controlled by providing protective surface cover, reducing runoff, and increasing water infiltration. There are many tillage and conservation practices that help control erosion. Conservation tillage and no-till, using cover crops, leaving crop residues on the surface, and planting a high proportion of sod-forming crops in the cropping system are suitable management practices on soils that have short, irregular slopes, such as the Varysburg and Chenango soils. Contour tillage, stripcropping, terraces, and diversions are more suitable on soils that have smooth, long, uniform slopes, such as the sloping Mardin and Langford soils.

Most soils that have slopes of more than 3 percent require some type of water erosion control. Soils that are high in silt content and lack coarse fragments, such as the Allard, Williamson, and Collamer soils, are the most susceptible to erosion.

Soil blowing is a hazard on some soils, such as the sandy Colonie soils and the cleared and drained areas of the organic Edwards and Palms mucks. Blowing is particularly a problem when the surface is dry. Planting windbreaks, regulating the water table, and irrigating are effective in reducing wind erosion.

The effectiveness of a particular combination of conservation practices differs from one soil to another, and different combinations can be equally effective on the same soil. The local representatives of the Erie County Soil and Water Conservation District and the Soil Conservation Service are available to suggest effective practices to reduce soil erosion.

Soil drainage is a major management need on about half the potential cropland in the survey area. Some soils are so wet that they cannot be used to produce crops common to the area without extensive drainage. Poorly drained and very poorly drained Cheektowaga, Canandaigua, Edwards, Halsey, Lyons, Lakemont, Lamson, Palms, Patchin, and Wayland soils are examples of such soils. Seasonal wetness interferes with the early planting, growth, and harvesting of most crops on somewhat poorly drained soils, such as the Appleton, Churchville, Niagara, Odessa, Raynham, and Volusia soils. Crops on these soils respond well to improved drainage. Yields on artificially drained soils are often as high as on naturally well drained soils.

Some areas of well drained and moderately well drained soils, such as the Allard, Langford, Lima, Phelps, Hudson, and Teel soils, include small areas of wetter soils that require randomly placed subsurface drains to make management of the soils more uniform.

The type of drainage system needed varies with the kind of soil. A combination of surface and subsurface drainage is needed in most areas of the poorly drained and very poorly drained soils. Installing drainage outlets is often difficult and expensive because these soils are low on the landscape. The surface can be drained by open ditches, grassed waterways, land smoothing, and bedding systems, but subsurface drainage is mainly by tile or plastic drains.

Drains must be more closely spaced in slowly permeable soils than in more permeable soils. Subsurface drainage is slow in the Erie, Remsen, and Rhinebeck soils. These soils may also require surface drainage. Subsurface drains can be used in the more rapidly permeable Lamson, Halsey, and Red Hook soils if adequate outlets are available. Some wet, sloping soils, such as the Darien and Erie soils, can be improved by interceptor drains that divert runoff and downslope seepage. Information on type and comparative cost of drainage systems is available at the Erie County Soil and Water Conservation District office and the local office of the Soil Conservation Service.

Surface stones and rock outcrops severely limit soil use for crops and pasture in a few areas, particularly near the east-west trending limestone escarpment in the northern part of the county. These surface features interfere with the use of farm equipment on, for example, the very stony Wassaic soils and the Benson-Rock outcrop complex. Use of these soils is mostly limited to permanent pasture, woodland, or wildlife habitat. Surface stones and rock outcrop, however, can also interfere with the reseeding and fertilizing necessary to maintain quality pasture. It may be feasible to remove the larger stones from some areas that have few other limiting soil properties, but the limitations of map units with rock outcrop are generally not easily overcome.

Droughtiness is a problem with some of the soils in the county. The available water capacity of soils is a major consideration in growing crops. Soils that are sandy and gravelly, have a fragipan, or are shallow or moderately deep to bedrock have a relatively low capacity to store moisture and are droughty. In Erie County, the gravelly Chenango soils, sandy Colonie soils, shaly Blasdell soils, Erie soils that have a fragipan, and shallow Benson soils have a relatively low available water capacity. It can be improved by maintaining or increasing the organic matter content and improving the structure of these droughty soils. This can be done by growing green manure crops, returning crop residue to the soil, and adding animal wastes.

Soil tilth is an important factor in the germination of seedlings, the infiltration of water into the soil, and the cultivation process. Soils with good tilth have a granular structure and are porous and easy to cultivate.

Tillage has a strong influence on soil tilth. Excessive tillage tends to reduce the organic matter content and break down the structure of the soil. The Alton and Chenango soils, which are deep, well drained or excessively drained, and coarse textured or moderately coarse textured, can be tilled without damaging soil tilth. The wetter and finer textured Odessa and Lakemont soils, however, must be tilled at the proper moisture content to prevent deterioration of the natural soil structure. Plowing or cultivating when these soils are wet causes puddling and results in hard surface crusts and clods when the soils dry.

Cultivating at the proper moisture content; including cover crops, green manure crops, and sod crops in the cropping system; returning crop residues to the soil; and adding manures help keep the soil granular, porous, and in good tilth.

Soil fertility is important for optimum crop production. It can be maintained by the addition of lime and/or fertilizer. The amounts needed depend on the natural content of lime and nutrients in the soil, on the need of the particular crop, and on the level of yield desired.

Organic matter content is an important factor in soil fertility. The surface layer of the average soil in Erie County contains about 3.5 percent organic matter. The poorly drained and very poorly drained Chippewa and Wayland soils have a somewhat higher organic matter content. The organic matter contains nitrogen, but much of it is in a complex organic form that cannot be used by plants until it is decomposed by soil micro-organisms. It must be supplemented by additions of nitrogen fertilizer. Management that increases the level of organic matter in the soil by using green manure crops and sod crops and incorporating crop residues into the soil improves the natural nitrogen content.

Fertilization should be timed for maximum use of nitrogen by plants. Nitrogen is lost by leaching from the rapidly permeable Chenango soil and by denitrification of the wetter and less permeable Ilion soil. Small amounts of nitrogen applied when planting and as side dressing while the crops are growing generally give the best results.

Erie County soils are usually low in phosphorus, and the coarse textured Colonie and Chenango soils tend to be very low. Applying appropriate amounts of commercial fertilzer containing phosphorus to the soil is essential for good crop growth.

Most of the soils in the county are low to medium in ability to supply potassium; however, the Rhinebeck and Schoharie soils, which have a clayey subsoil, are higher in potassium. Even soils that have a relatively high potassium content need additional fertilizer containing potassium for optimum yields.

Additions of lime and fertilizer should be based on soil tests. The soils in the survey area need lime for optimum yields of most crops. For assistance in obtaining soil tests and recommendations contact the local office of the Cooperative Extension Service. Information on recent research findings and fertilizer recommendations can be found in *Cornell Recommends for Field Crops* and *Vegetable Production Recommendations.* These bulletins were prepared by the staff of Cornell University, College of Agriculture, Ithaca, New York. These references along with this publication can be used as a guide in determining lime and fertilizer needs for various crops.

Special crops, including vegetable and fruit crops, vineyards, and orchards, are an important part of the agriculture in Erie County in addition to the crops listed in table 5.

Vegetables, primarily spinach, lettuce, sweet corn, and tomatoes, and fruit crops, mainly strawberries and melons, are grown mostly on moderately well drained to somewhat excessively drained, gravelly soils derived from glacial outwash. These crops grow in various areas of the county but are concentrated in Eden Valley on the Alton and Phelps soils. Vineyards and orchards are on various soils, mostly in the vicinity of Lake Erie where climatic factors are favorable. About 18,000 acres is used for these specialized crops each year in Erie County.

The latest information and suggestions for growing orchard and vegetable crops and their estimated yields can be obtained from the local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. 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 5 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 detailed 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 for crops, 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 few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

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

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. Capability units are not used in this survey area.

The capability classification of each map unit is given in the section "Detailed soil map units" and in table 6. The acreage of soils in each capability class and subclass is shown in table 7.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, however, and the U.S. Department of Agriculture is attempting to identify it in order that it can be used to best advantage now and preserved for future generations.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed according to acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not in urban and built-up land or water areas. It must be used for producing food or fiber or be available for this use.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has a favorable temperature and growing season and acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated for long periods and is not flooded during the growing season. The slope ranges mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland consult the local staff of the Soil Conservation Service.

About 223,000 acres, or nearly 35 percent, of Erie County meets the soil requirements for prime farmland. Areas of prime farmland are scattered throughout the county, but many are concentrated in major valleys in map units 6, 9, and 10 of the general soil map. Approximately 170,000 acres of this prime farmland is used for crops. The crops grown on this land are mainly corn, small grains, hay, and vegetables.

A recent trend in land use in some parts of the county, particularly in the suburbs around Buffalo, has been the use of prime farmlands for industrial and urban purposes. This loss of prime farmland puts pressure on marginal lands, which are then farmed although they generally are more erodible, droughty, difficult to cultivate, and less productive.

Soil map units that make up prime farmland in Erie County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Soils that have limitations—a high water table, flooding, or inadequate rainfall—may qualify for prime farmland if limitations are overcome by such measures as drainage, flood control, or irrigation. In the following list, an asterisk (*) is placed next to the soils that have a seasonal high water table. Onsite evaluation is necessary to see if this limitation has been overcome.

The map units that meet the soil requirements for prime farmland are:

AlA	Allard silt loam, 0 to 3 percent slopes
AlB	Allard silt loam, 3 to 8 percent slopes
AmA	Alton fine gravelly loam, 0 to 3 percent slopes
AmB	Alton fine gravelly loam, 3 to 8 percent slopes
AnB	Alton gravelly loam, silty substratum, 3 to 8 percent slopes
ApA	Appleton silt loam, 0 to 3 percent slopes (where drained)
ApB	Appleton silt loam, 3 to 8 percent slopes (where drained)
ArB	Arkport very fine sandy loam, 3 to 8 percent slopes
BlA	Blasdell shaly silt loam, 0 to 3 percent slopes
BlB	Blasdell shaly silt loam, 3 to 8 percent slopes
CeA	Castile gravelly loam, 0 to 3 percent slopes
CeB	Castile gravelly loam, 3 to 8 percent slopes
CfB	Cayuga silt loam, 3 to 8 percent slopes
CgB	Cazenovia silt loam, 3 to 8 percent slopes
CkA	Chenango gravelly loam, 0 to 3 percent slopes
CkB	Chenango gravelly loam, 3 to 8 percent slopes
ClA	Chenango channery silt loam, fan, 0 to 3 percent slopes
ClB	Chenango channery silt loam, fan, 3 to 8 percent slopes
CsA	Collamer silt loam, 0 to 3 percent slopes
CsB	Collamer silt loam, 3 to 8 percent slopes
CtB	Collamer silt loam, till substratum, 3 to 8 percent slopes
DaB	Danley silt loam, 3 to 8 percent slopes
DbA	Darien silt loam, 0 to 3 percent slopes (where drained)
DbB	Darien silt loam, 3 to 8 percent slopes (where drained)
DcB	Darien silt loam, silty substratum, 3 to 8 percent slopes (where drained)
FbA	Farnham shaly silt loam, 0 to 3 percent slopes
FbB	Farnham shaly silt loam, 3 to 8 percent slopes
FcA	Farnham shaly silt loam, fan, 0 to 3 percent slopes
FcB	Farnham shaly silt loam, fan, 3 to 8 percent slopes
GaA	Galen very fine sandy loam, 0 to 3 percent slopes
GaB	Galen very fine sandy loam, 3 to 8 percent slopes
GbB	Galen fine sandy loam, till substratum, 3 to 8 percent slopes
Hm	Hamlin silt loam
HoA	Honeoye loam, 0 to 3 percent slopes
HoB	Honeoye loam, 3 to 8 percent slopes
HuB	Hudson silt loam, 3 to 8 percent slopes
Ke	Kendaia silt loam (where drained)
LmA	Lima loam, 0 to 3 percent slopes
LmB	Lima loam, 3 to 8 percent slopes
Mg	Middlebury silt loam
Mh	Minoa very fine sandy loam (where drained)
NfA	Niagara silt loam, 0 to 3 percent slopes (where drained)
NfB	Niagara silt loam, 3 to 8 percent slopes (where drained)
Ng	Niagara silt loam, fan (where drained)
Nh	Niagara silt loam, till substratum (where drained)
Od	Odessa silt loam (where drained)
OvA	Ovid silt loam, 0 to 3 percent slopes (where drained)
OvB	Ovid silt loam, 3 to 8 percent slopes (where drained)
PbA	Palmyra gravelly loam, 0 to 3 percent slopes
PbB	Palmyra gravelly loam, 3 to 8 percent slopes
PhA	Phelps gravelly loam, 0 to 3 percent slopes
PhB	Phelps gravelly loam, 3 to 8 percent slopes
RaA	Raynham silt loam, 0 to 3 percent slopes (where drained)

RaB	Raynham silt loam, 3 to 8 percent slopes (where drained)
RgA	Rhinebeck silt loam, 0 to 3 percent slopes (where drained)
RgB	Rhinebeck silt loam, 3 to 8 percent slopes (where drained)
RkA	Rhinebeck gravelly loam, 0 to 3 percent slopes (where drained)
RkB	Rhinebeck gravelly loam, 3 to 8 percent slopes (where drained)
SaA	Schoharie silt loam, 0 to 3 percent slopes
SaB	Schoharie silt loam, 3 to 8 percent slopes
Sd	Scio silt loam
Sw	Swormville clay loam (where drained)
Te	Teel silt loam
To	Tioga silt loam
VaB	Valois gravelly silt loam, 3 to 8 percent slopes
VbA	Varysburg gravelly loam, 0 to 3 percent slopes
VbB	Varysburg gravelly loam, 3 to 8 percent slopes
WaA	Wassaic silt loam, 0 to 3 percent slopes
WaB	Wassaic silt loam, 3 to 8 percent slopes
WeB	Williamson silt loam, 3 to 8 percent slopes

woodland management and productivity

Robert E. Smith, Jr., forester, Soil Conservation Service, assisted in the preparation of this section.

The forests in Erie County grow in two major land resource regions—the Lake States Fruit, Truck, and Dairy Region and the Northeastern Forage and Forest Region (*11*). The southeastern quarter of the county is a part of the Glaciated Allegheny Plateau and Catskill Mountains area. The southwestern corner of the county is in the Erie Fruit and Truck area. The remainder of the county is a part of the Ontario Plain and Finger Lakes area.

In the Fruit, Truck, and Dairy Region, elm and red maple are common in the lowlands; and beech, basswood, white ash, sugar maple, hickory, hemlock, tulip poplar, and black walnut grow on the better drained soils. In the Northeastern Forage and Forest Region, woodlands consist mainly of beech, sugar maple, basswood, black cherry, and white ash; and oaks grow on the drier south- and west-facing slopes.

In 1968 the Forest Service considered 203,700 acres, or approximately 30 percent of Erie County, forested (*9*). Nearly all of the forest land was classified as commercial (producing or capable of producing crops of industrial wood and not withdrawn from this use). About 33 percent of the total forest land was owned by farmers, about 65 percent was held by other private owners, and only 2 percent was publicly owned.

Six forest types were recognized in the county. These are groupings of trees that are named according to the dominant species in the group. The six forest types, the acreage they covered, and the percentage of the growing stock (live trees of commercial species) they produced were:

Maple-beech forest, 82,800 acres, 40 percent
Elm-ash-red maple forest, 81,900 acres, 37 percent
Oak forest, 12,400 acres, 10 percent
Aspen forest, 10,600 acres, 2 percent
White pine forest, 5,400 acres, 5 percent
Other softwood plantations, 10,600 acres, 6 percent

Fifty-two percent of the commercial forest land was stocked with seedling- to sapling-size trees; 23 percent with sawtimber (live trees with a minimum diameter of 9 inches for softwoods and 11 inches for hardwoods); and 14 percent with poletimber (live trees at least 5 inches in diameter). Eleven percent was classified nonstocked, or less than 16.7 percent of the land in trees.

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 commercial wood crops and soils managed for urban woodlots 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 excellent productivity; 2, very good; 3, good; 4, fair; and 5, poor. 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 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. Species listed in this column are not recommended for any given set of conditions, but these species are best suited to planting on that particular soil. Landowners and forest managers can minimize planting failures by matching tree species with a suitable soil. Professional foresters can provide information on planting and caring for trees and on the best species to plant.

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, assisted in preparing this section.

Wildlife is an important natural resource of Erie County even though much of the county is heavily urbanized. In the urban area and suburban fringes, songbirds are the major wildlife species, but cottontail rabbits and ring-necked pheasants are also common in the suburban areas. Rabbits, pheasants, white-tailed deer, ruffed grouse, and gray squirrels populate the rural agricultural parts of the county, and there are wild turkeys in the southeastern section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 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 asters, goldenrod, beggarweed, and quackgrass.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are honeysuckle, 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, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, 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 rabbit, 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, and deer.

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, and the available water capacity in the upper 40 inches of the soil 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 for landfill cover, 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*. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are 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 to 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. This table lists limitations to use of the soils as a source of embankment fill. The limitations 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 limitations 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, assisted in preparing 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 index properties

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 their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "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 generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 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.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil (fig. 10). 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

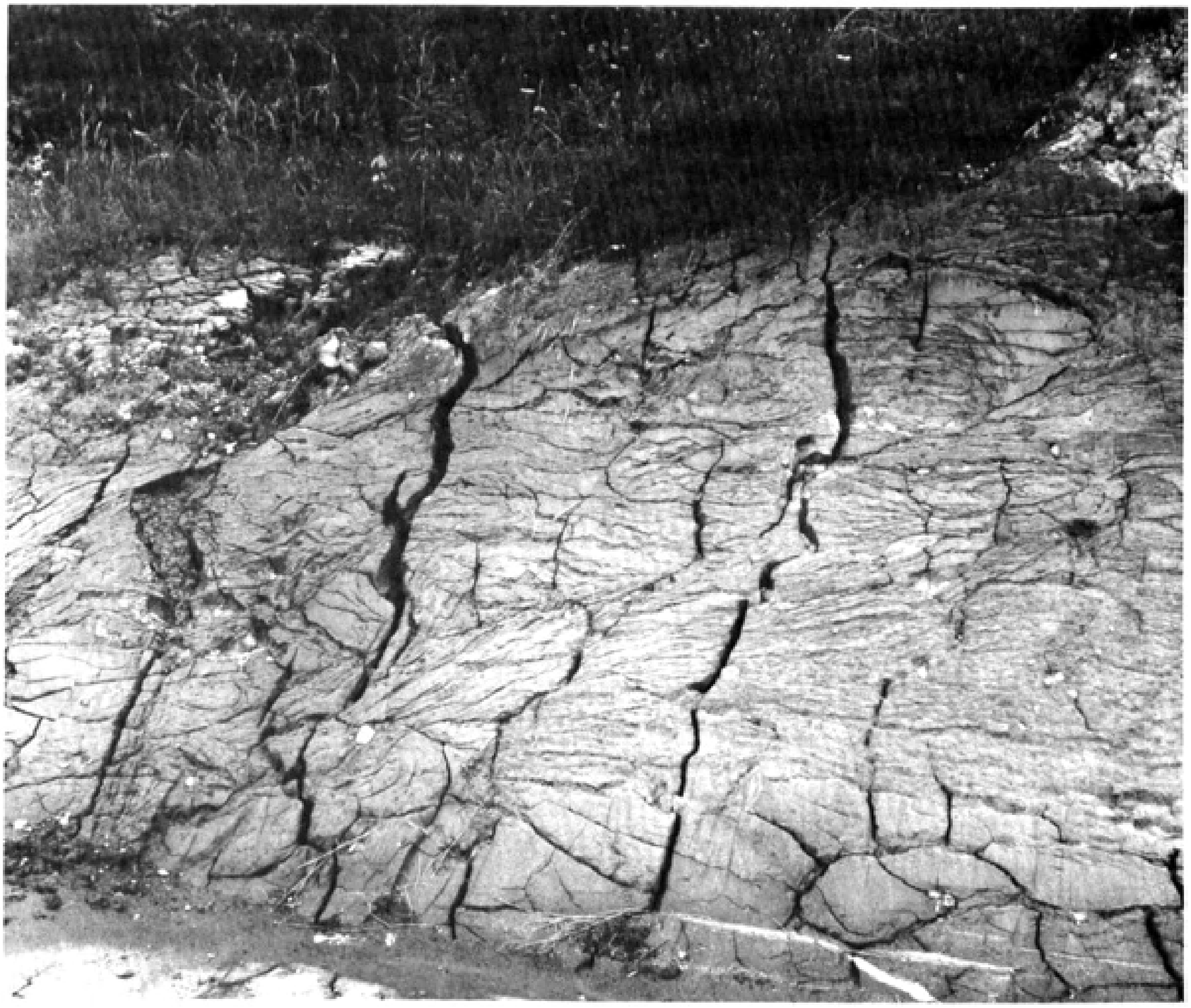


Figure 10.—Cracks in the subsoil and substratum of the clay-rich Hudson soils result from wetting and drying. These cracks increase the slipping and slumping of the soil.

can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 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 are 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 excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are 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 their 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 (AASHTO); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO); Liquid limit—T 89 (AASHTO); Plasticity index—T 90 (AASHTO); Moisture density, Method C—T 99 (AASHTO); Shrinkage—D 427 (ASTM).

engineering properties of geologic deposits

This section discusses the engineering characteristics of the various unconsolidated geologic deposits in Erie County and their relation to soils. This discussion is to help planners, designers, engineers, contractors, and others who are associated with projects involving earthy materials. It should be noted that soil engineering terms and similar soil science terms can have a different meaning.

The following geologic deposits occur in Erie County: glacial till, glacial outwash, and ice-contact, delta, beach ridge, lacustrine, alluvial, and organic deposits. The engineering significance of each geologic deposit is influenced by its mode of deposition, which determines the texture and internal structure of the landform. Other influences are the position on the landscape and the position of the water table. The geologic deposits in Erie 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

Deep till deposits are unstratified, highly variable mixtures of all particle sizes ranging from rock fragments to clay. This material was scoured and transported from nearby sources by glacial ice and deposited as ground moraine or end moraine. Bedrock is generally at a depth of more than 5 feet. In some small areas this depth to rock may be less, or a few rock outcrops may occur. The individual rock and mineral fragments reflect the types of bedrock in the immediate area.

The Appleton, Cazenovia, Chippewa, Danley, Darien, Erie, Honeoye, Ilion, Kendaia, Langford, Lima, Lyons, Mardin, Marilla, Ovid, Remsen, Valois, and Volusia soils formed in mixed deep till deposits. The Valois soils are on end moraines and may contain more water-worked material than is usually found in deep till deposits. The Galen, till substratum, soil has a veneer of stratified coarse-grained material over deep glacial till; and the Canadice, shaly till substratum, the Collamer, till substratum, and the Niagara, till substratum, soils are stratified fine-grained material underlain by deep glacial till.

These soils are the most dense and compact of the unconsolidated soil deposits in the county. Most of the tills have been subjected to the compactive weight of overriding ice. Deep till soils are nearly level to very steep, but most of these soils are nearly level or gently sloping. Cut and fill earthwork is required in most construction. Generally, these soils provide stable, relatively incompressible foundations for engineering projects. Fill material from these deposits, when properly compacted, generally provides stable embankments. Steep cut slopes, however, are subject to surface sloughing and erosion.

shallow-to-rock deposits

Shallow-to-rock deposits are unstratified mixtures of glacial till deposited as a veneer over bedrock. The soil is usually 1 to 5 feet thick, and rock outcrops are common in some areas. The landforms and topography are generally controlled by the bedrock.

The Angola, Aurora, Brockport, Hornell, Manlius, Orpark, and Patchin soils formed over shale; the Derb and Schuyler soils formed over siltstone and shale; and the Benson, Farmington, Newstead, and Wassaic soils formed over limestone. These bedrock units are described in the section "Physiography and geology."

Soils that formed in shallow-to-rock deposits of glacial till have adequate foundation strength to support light structures. The main engineering concerns may relate to the underlying bedrock and ground-water conditions. In general the shale bedrock is softer and more deeply weathered than the limestone. Fill material is limited in quantity.

stratified coarse-grained deposits

These stratified deposits consist of materials, dominantly gravel and sand, sorted by glacial melt water and coarser materials deposited by fluvial action. They occupy outwash plains and terraces, alluvial fans, ice-contact kames and eskers, beach ridges, and the coarser parts of deltas, lacustrine beaches, and flood plains. The strata within these deposits may be well sorted or poorly sorted and may contain particle sizes from cobbles to silt. The deposits are generally loose and porous and have moderately rapid to rapid permeability.

The Alton, Blasdell, Castile, Chenango, Farnham, Halsey, Palmyra, Phelps, and Red Hook soils formed in gravelly outwash on plains and terraces, beach ridges, kames, eskers, and deltas. The Arkport and Galen soils formed in sandy delta deposits. The Chenango and Farnham soils formed in alluvial fan deposits. The Colonie, Elnora, Getzville, Lamson, and Swormville soils formed in lacustrine sand deposits. The Rhinebeck, stratified substratum, soils formed along beach ridges. The Middlebury and Tioga soils formed in alluvium underlain by sand and gravel. The Allard and Scio soils formed in silty lacustrine or old alluvial deposits underlain by gravelly outwash. Coarse-grained deposits generally have relatively high soil strengths. Because they are loose and porous, most of these deposits are not highly erodible but tend to settle when vibrated. The Middlebury and Tioga soils are commonly 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 as: 1. Fill material for highway embankments. 2. Fill material for parking areas and developments. 3. Fill material to decrease stress on underlying soils at construction sites. 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. Protective blankets to drain and help stabilize wet cut slopes. 10. Sources of sand and gravel for general use.

stratified fine-grained deposits

These are mainly lacustrine fine-grained sediments transported by glacial melt water and deposited in quiet preglacial lakes and ponds. Some are more recent slack water deposits or fans on flood plains. Distinct layers, or laminations, generally consist of silt- and clay-sized particles. Although these deposits are mostly fine sand and silt, there is generally enough clay to make them plastic and sticky.

The Canadice, Cheektowaga, Claverack, Cosad, Hudson, Lakemont, Odessa, Rhinebeck, and Schoharie soils formed in deep lake-laid silt and clay deposits. The Canandaigua, Collamer, Niagara, Raynham, and Williamson soils formed in deep silty areas on deltas. The Minoa soils formed in fine sandy parts of deltas. The Alton, silty substratum, soils formed on beach ridges underlain by silt and clays. The Darien, silty substratum, and Langford, silty substratum, soils formed in saturated glacial till underlain by silts and clays. The Niagara, fan phase, soils formed in silty alluvial fans; and the Hamlin, Teel, and Wayland soils are on alluvial flood plains.

Because of their fine texture and high moisture content, these deposits have relatively low strength. They are generally highly compressible and tend to settle over long periods. The soils with a high content of fine sand and silt are less compressible but are highly erodible and susceptible to frost damage. The alluvial soils are prone to flooding.

These fine-grained deposits are difficult to use for engineering works, especially the flat, wet soils that are subject to ponding, such as on the Canandaigua soils. Sites proposed for embankments and heavy structures or buildings must be investigated for soil strength, settlement characteristics, and the effects of ground water.

organic deposits

Organic deposits are mostly accumulations of plant remains, but in places they include a minimal amount of mineral soil. These deposits occur in very poorly drained depressions and bogs that are covered with water most of the year.

The Edwards soils consist of organic matter over marl deposits. The Palms soils are underlain by lacustrine or till fine-grained deposits. The soils in organic deposits can not be used for foundations because they are wet, weak, and highly compressible. Generally, the organic material should be removed and replaced with suitable backfill. If it is filled over, long-term settlement results.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). 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 better aerated than 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 fine-loamy, 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. Kendaia is an example of a series name.

soil series and their morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*7*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*10*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Allard series

The Allard series consists of deep, well drained soils on terraces along streams. These soils formed in a mantle of silty deposits underlain by stratified glacial outwash. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Allard soils are closely associated with the Arkport, Chenango, Scio, Tioga, and Middlebury soils. The Allard soils are more silty than the Arkport soils and do not have the gravel content of the Chenango soils. They are better drained and do not have the deep, silty deposits of the Scio soils. The Allard soils, which are on higher terraces adjacent to the lower Tioga and Middlebury soils, are not subject to flooding as those soils are.

Typical pedon of Allard silt loam, 0 to 3 percent slopes, in the town of Concord, 0.7 mile west of the junction of Zoar Valley and Grote Roads, 100 feet north of Zoar Valley Road:

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam; weak fine and medium granular structure; very friable; many fine roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

B21—9 to 12 inches; strong brown (7.5YR 5/6) silt loam; weak fine and medium subangular blocky structure; very friable; many fine roots; many fine pores; strongly acid; clear wavy boundary.

B22—12 to 17 inches; yellowish brown (10YR 5/4) light silt loam; weak and moderate fine and medium subangular blocky structure; friable; common fine roots; many fine pores; strongly acid; gradual wavy boundary.

B23—17 to 27 inches; yellowish brown (10YR 5/4) light silt loam; moderate medium subangular blocky structure; friable; few roots; few pores; 5 percent coarse fragments; few high chroma mottles at contact with IIC horizon; strongly acid; gradual wavy boundary.

IIC—27 to 60 inches; brown (10YR 4/3) and light brownish gray (10YR 6/2) very gravelly loamy sand; single grain; loose; few roots; 60 percent coarse fragments; few cobblestones; medium acid.

The thickness of the solum and depth to sandy or gravelly material ranges from 20 to 36 inches. Depth to bedrock is generally 10 feet or more and is everywhere more than 5 feet. The solum is typically free of coarse fragments, but a few pebbles or thin gravelly layers are within the solum of some pedons.

The Ap horizon has value of 3 to 5 and chroma of 2 to 4. It is silt loam to fine sandy loam. Reaction is very strongly acid to medium acid, unless limed.

The B horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 8. The B horizon is very fine sandy loam or silt loam. It has weak or moderate subangular blocky or granular structure or it is massive. Consistence is very friable or friable, except in some pedons the lower part of the B horizon is firm. Some pedons contain lamellae, or irregular-shaped bodies that are slightly darker, measurably higher in clay, and more firm than the matrix, but which have a total thickness of 6 inches. Some pedons have high-chroma mottles below a depth of 24 inches. Reaction is strongly acid to medium acid.

The IIC horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 4. It is loose loamy sand, or sandy and gravelly material dominated by particles coarser than fine sand. Coarse fragment content ranges from 0 to 70 percent by volume. Reaction is strongly acid to neutral.

Alton series

The Alton series consists of deep, well drained to somewhat excessively drained soils on terraces, beach ridges, and kames. These soils formed in glacial outwash and beach deposits. In some areas, the glacial outwash material is 40 to 60 inches thick over lake-laid silt and very fine sand. Slope ranges from 0 to 15 percent but is dominantly 3 to 8 percent.

The Alton soils are closely associated with the moderately well drained Phelps soils. They are similar to the Palmyra and Blasdell soils; however, they have a coarser textured subsoil than Palmyra soils, and they have a lower shale fragment content and are less acid than the Blasdell soils. Alton soils are often near Arkport, Colonie, and Lamsom soils, but have a higher coarse fragment content than those soils.

Typical pedon of Alton fine gravelly loam, 3 to 8 percent slopes, in the town of Alden, 0.1 mile west of the junction of West Main Street and Sandridge Road, at the edge of a gravel pit:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine gravelly loam; moderate fine granular structure; very friable; many fine and medium roots; 30 percent coarse fragments; slightly acid (limed); abrupt smooth boundary.

B21—9 to 18 inches; yellowish brown (10YR 5/4) fine gravelly loam; weak fine subangular blocky structure; friable; common fine and medium roots; common fine pores; 30 percent coarse fragments; medium acid; clear wavy boundary.

B22—18 to 30 inches; dark yellowish brown (10YR 4/4) fine very gravelly sandy loam; weak medium subangular blocky structure; very friable; few fine roots; common fine pores; some pockets with clay films around pebbles; 40 percent coarse fragments; slightly acid; clear wavy boundary.

IIC1—30 to 46 inches; dark brown (10YR 3/3) fine very gravelly loamy sand; single grain; loose; few fine roots; 40 percent coarse fragments; slightly acid; clear wavy boundary.

IIC2—46 to 60 inches; dark brown (10YR 3/3) fine very gravelly loamy sand, becomes stratified at 50 inches; single grain; 40 percent coarse fragments; mildly alkaline.

The thickness of the solum ranges from 30 to 60 inches. Carbonates are at a depth of about 40 to 80 inches. Coarse fragments are mainly pebbles less than one-half inch in their longest dimension, but they range up to 2 inches in some horizons. Coarse fragments are 20 to 35 percent by volume in the A horizon, 20 to 50 percent in the upper part of the B horizon, and 40 to 60 percent in the lower part of the B horizon and in the C horizon. Fine sand and coarser sand range from 50 to 70 percent of the fine earth fraction in the solum.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 2 through 4. It is fine gravelly loam or fine gravelly fine sandy loam. Reaction is very strongly acid to strongly acid.

The B horizon has hue of 10YR through 7.5YR, value of 3 through 6, and chroma of 3 through 6. The fine earth fraction of the B horizon above 20 inches ranges from sandy loam to loam; below 20 inches the texture is coarser than loam. Some pedons do not have patchy clay films. Reaction is strongly acid to neutral, and acidity commonly decreases with increased depth.

The C horizon has hue of 7.5YR through 2.5Y, value of 3 to 5, and chroma of 2 to 4. It is stratified gravel and sand, very gravelly loamy sand, or very gravelly sand that is predominantly derived from limestone and also some from sandstone and shale. In some areas, the gravelly outwash deposits are underlain by silty lacustrine deposits below 40 inches.

Angola series

The Angola series consists of moderately deep, somewhat poorly drained soils on till plains. These soils formed in glacial till deposits. Shale bedrock is at a depth of 20 to 40 inches. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Angola soils formed in the same kind of parent material as the associated better drained Aurora soils. The Angola soils are also associated with the Brockport, Darien, Ovid, Orpark, and Ilion soils. The Angola soils are not as clayey as the Brockport soils and not as deep to bedrock as the Darien and Ovid soils. They are less acid than the Orpark soils and are better drained and deeper than the Ilion soils.

Typical pedon of Angola silt loam, 0 to 3 percent slopes, in the town of Orchard Park, 0.3 mile west of the intersection of Abbott Road and U.S. Highway 20:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots and pores; 5 percent coarse fragments; slightly acid; clear smooth boundary.

A2—9 to 11 inches; grayish brown (2.5Y 5/2) silt loam; many (30 percent) fine and medium distinct yellowish brown (10YR 5/4) and olive brown (2.5Y 4/4) mottles, few light grayish brown (2.5Y 6/2) skeletans; weak fine subangular blocky structure; friable; many fine roots and pores; 5 percent coarse fragments; slightly acid; clear wavy boundary.

B2tg—11 to 26 inches; dark grayish brown (2.5Y 4/2) light silty clay loam; ped interiors with many (50 percent) fine and medium distinct yellowish brown (10YR 5/4-5/6) and common light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; common fine roots decreasing with depth; common fine pores; grayish brown (2.5Y 5/2) clay films in pores and along some ped faces; 10 percent coarse fragments; neutral in the lower part; clear smooth boundary.

C—26 to 30 inches; dark grayish brown (2.5Y 4/2) shaly heavy silt loam; common fine and medium distinct olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/4) mottles; weak medium platy structure; firm; few pores, most pores with clay linings; 25 percent coarse fragments; mildly alkaline; gradual smooth boundary.

IIR—30 inches; olive brown (2.5Y 4/4) to dark olive gray (5Y 3/2) brittle shale bedrock; horizontal strata; calcareous.

The thickness of the solum ranges from 20 to 30 inches, and bedrock is at a depth of 20 to 40 inches. The bedrock is brittle, soft or hard, neutral or calcareous shale. Coarse fragments range from 0 to 15 percent by volume in the A horizon, from 2 to 30 percent in the B horizon, and from 15 to 50 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is silt loam or silty clay loam. Consistence is friable or firm. Reaction is medium acid to mildly alkaline. There is no A2 horizon in some pedons.

The matrix of the B horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4. Ped faces have chroma of 2 or less if matrix chroma is greater than 2. At least one subhorizon has more than 40 percent by volume of chroma greater than 2. The B horizon ranges from loam to silty clay loam or the shaly analogs of those textures. Clay films are on both vertical and horizontal ped faces and are thicker in the lower part of the horizon. Reaction is medium acid to mildly alkaline.

The C horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 2 or 3. It ranges from shaly silt loam or shaly loam to very shaly silty clay loam. Some pedons have lime films on ped faces. Reaction is slightly acid to moderately alkaline.

The R horizon consists of olive, brown, gray, or black shale bedrock.

Appleton series

The Appleton series consists of deep, somewhat poorly drained soils on lowland till plains. These soils formed in glacial till deposits. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Appleton soils formed in the same kind of parent soil material as the better drained Honeoye and Lima soils. The Appleton soils are closely associated with the

Cazenovia, Ovid, and Lyons soils, but they contain less clay in the subsoil than the Cazenovia and Ovid soils and are better drained than the Lyons soils.

Typical pedon of Appleton silt loam, 0 to 3 percent slopes, in the town of Clarence, 100 feet south of Clarence Center Road and 0.1 mile west of Strickler Road:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium and fine granular structure; friable; many fine roots; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2—9 to 15 inches; pinkish gray (7.5YR 6/2) loam; common fine and medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; common light gray (10YR 7/2) skeletans; weak medium subangular blocky structure tending toward weak medium platy structure; friable; common fine roots; common fine pores; 10 percent coarse fragments; slightly acid; clear wavy boundary.

B&A—15 to 18 inches, dark brown (7.5Y 4/4) loam; common medium distinct yellowish brown (10YR 5/6) and brown (10YR 5/2) mottles; moderate medium subangular blocky structure tending toward weak medium prismatic structure; friable; few fine roots; common fine pores; few clay films in pores; thin coatings (fingers) of pinkish brown (7.5YR 6/3) surround some peds and extend the full depth of this horizon; 10 percent coarse fragments; neutral; gradual wavy boundary.

B2t—18 to 29 inches; reddish brown (5YR 4/3) gravelly heavy silt loam; many medium distinct strong brown (7.5YR 5/6) and few medium distinct gray (10YR 6/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine pores; reddish gray (5YR 5/2) ped faces; brown (7.5YR 5/2) clay films on some ped faces and in many pores; 20 percent coarse fragments; neutral; clear wavy boundary.

C—29 to 60 inches; reddish brown (5YR 5/3) gravelly loam; few medium faint brown (7.5YR 5/2) mottles; massive; firm; 25 percent coarse fragments; calcareous; mildly alkaline.

The thickness of the solum ranges from 20 to 36 inches and depth to carbonates from 18 to 32 inches. Depth to bedrock is more than 5 feet. Coarse fragments range from 5 to 30 percent by volume and generally increase with depth. Coarse fragments are mixed in size and kind, including limestone, shale, and sandstone.

The A1 or Ap horizon has value of 2 to 4 and chroma of 1 or 2. The Ap horizon has value of 6 when dry. Texture is loam, silt loam, or fine sandy loam. Reaction is medium acid to neutral. There is no A2 horizon in some pedons.

The B horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 4. High-chroma mottles are common to many, and low-chroma mottles are few to common. The B horizon is loam, light sandy clay loam, or silt loam or the gravelly analogs of these textures. Clay content is between 18 and 27 percent. Reaction is medium acid to mildly alkaline.

The C horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 4. It is fine sandy loam, loam, or silt loam or gravelly analogs of those textures. Reaction is mildly or moderately alkaline.

Arkport series

The Arkport series consists of deep, well drained soils on remnant deltas that are often dissected. These soils formed in glaciolacustrine deposits dominated by fine sand and very fine sand. Slope ranges from 3 to 40 percent but is dominantly 3 to 25 percent.

The Arkport soils are in a drainage sequence with the moderately well drained Galen soils, the somewhat poorly drained Minoa soils, and the poorly drained and very poorly drained Lamson soils. The Arkport soils are similar to the Allard, Collamer, and Colonie soils. They are not as silty in the subsoil as the Allard and Collamer soils and do not have the extremely high sand content of the Colonie soils.

Typical pedon of Arkport very fine sandy loam, 8 to 15 percent slopes, in the town of Concord, 5 miles southwest of the village of Springville on the east side of Grote Road and 0.3 mile north of Zoar Valley Road:

Ap—0 to 4 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, light grayish brown (10YR 6/2) crushed and dry; moderate medium granular structure; very friable; many fine and medium roots; very strongly acid; clear smooth boundary.

B21—4 to 15 inches; strong brown (7.5YR 5/6) very fine sandy loam, yellowish brown (10YR 5/4) in lower part; very weak very fine granular structure; very friable; common fine and medium roots; many pores; strongly acid; clear wavy boundary.

B22—15 to 23 inches; brown (10YR 5/3) very fine sandy loam; weak very fine subangular blocky structure; friable; few fine and medium roots; common pores; medium acid; clear wavy boundary.

A2&B23t—23 to 56 inches; pale brown (10YR 6/3) loamy very fine sand; single grain; very friable; clay-bridged lamellae of dark brown (10YR 4/3) loam approximately 1 inch thick at intervals of 3 to 6 inches; weak fine angular blocky structure; friable; lamellae aggregate 7 inches in thickness; few roots; many pores; slightly acid; gradual wavy boundary.

C—56 to 70 inches; light grayish brown (10YR 6/2) strata of loamy fine sand and very fine sand; single grain; firm, very friable when removed; neutral grading to mildly alkaline in the lower part.

The thickness of the solum ranges from 40 to 80 inches and depth to carbonates from 36 to 120 inches or more. Bedrock is at a depth of 5 feet or more. Depth to the uppermost thin lamellae ranges from 15 to 30 inches. The soil is 30 to 80 percent very fine sand plus silt and is more than 15 percent fine sand and coarser sand throughout. There are generally no coarse fragments, but they range up to 5 percent by volume in some pedons.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loamy very fine sand, very fine sandy loam, or fine sandy loam. It has weak or moderate, fine to coarse, granular structure and is very friable or friable. It ranges from very strongly acid through neutral.

The B2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is loamy fine sand, loamy very fine sand, or very fine sandy loam. It is massive or single grain, or has very weak or weak, fine or medium, granular or subangular blocky structure. Consistence is loose to friable. Reaction ranges from very strongly acid to neutral.

The A2 part of the A2&B2t horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 4. It is fine sand to loamy very fine sand. It is structureless or has weak or very weak, granular or subangular blocky structure, and it is loose or very friable. The B2t part of the A2&B2t horizon is silt loam or very fine sandy loam to loamy fine sand. Its color is similar to the B2 horizon, except value is as low as 3. It is massive, or it has weak, fine, blocky or weak, thin, platy structure, and it is friable or firm. The A2&B2t horizon ranges from strongly acid to neutral.

The C horizon has hue of 5YR through 10YR, value of 4 to 6, and chroma of 2 to 4. It is fine sand to loamy very fine sand. It is massive or single grain with loose to friable consistence. It ranges from medium acid through mildly alkaline.

Aurora series

The Aurora series consists of moderately deep, moderately well drained soils on till plains where the topography is influenced by the underlying bedrock. These soils formed in shaly glacial till deposits. Slope ranges from 8 to 15 percent.

The Aurora soils are in a drainage sequence with the somewhat poorly drained Angola soils. They are closely associated with the Orpark, Manlius, Danley, and Darien soils. The Aurora soils are not as acid as the Orpark soils and have a lower shale content than the Manlius soils. They are not as deep to bedrock as the Danley and Darien soils.

Typical pedon of Aurora shaly silt loam, 8 to 15 percent slopes, in the town of Orchard Park, 0.3 mile east of the U.S. Highway 20A and Abbott Road intersection:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) shaly silt loam; moderate medium granular structure; friable; many fine roots and pores; 20 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2—9 to 13 inches, pale brown (10YR 6/3) shaly silt loam; moderate medium subangular blocky structure; friable; many fine roots; common fine pores; few lighter skeletans; 15 percent coarse fragments; slightly acid; clear irregular boundary.

B21t—13 to 24 inches; olive brown (2.5Y 4/4) shaly silty clay loam; common medium distinct yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; firm; grayish brown (2.5Y 5/2) clay films lining pores and on many ped faces; common fine roots and pores; 15 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—24 to 33 inches, dark grayish brown (2.5Y 4/2) shaly silty clay loam; few medium distinct yellowish brown (10YR 5/4-5/8) and grayish brown (2.5Y 5/2) mottles; moderate medium and coarse subangular blocky structure; firm; few roots; common fine pores; grayish brown (2.5Y 5/2) clay films lining all pores and continuous on many ped faces; 25 percent coarse fragments; neutral; clear wavy boundary.

R—33 inches; olive gray (5Y 4/2) to very dark grayish brown (2.5Y 3/2) shale bedrock; brittle; partial weathering of bedrock in upper part; mildly alkaline.

The thickness of the solum ranges from 20 to 40 inches and generally corresponds to the depth of the bedrock. Coarse fragments are dominantly soft shale, but they also include some sandstone and limestone. These fragments range from 15 to 30 percent by volume in the surface layer and from 2 to 35 percent in the subsoil.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It is shaly silt loam or shaly loam. Structure is moderate, medium granular or weak, medium, very fine subangular blocky. Reaction is strongly acid to neutral. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is typically unmottled, but some pedons have a few faint mottles. Structure is weak to moderate, medium subangular blocky or weak, thin platy. Reaction is strongly acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 to 5. It is silty clay loam or silt loam or the shaly analogs of these textures. The B horizon has distinct mottles in the upper 10 inches. Reaction ranges from medium acid to moderately alkaline.

In some pedons there is a C horizon. The C horizon is similar to the B2 horizon but differs in being massive or having weak platy structure. It ranges from neutral to moderately alkaline.

The underlying bedrock, or R horizon, is slightly acid to calcareous, soft or hard shale or, in a few places is hard limestone. The shale bedrock may be interbedded with hard limestone or with thin strata of fine grained sandstone.

In the survey area, these soils are taxadjuncts to the Aurora series because they do not have enough interfingering of albic material into the argillic horizon to classify as Glossaquic. This difference does not affect the use and management of the soils.

Benson series

The Benson series consists of shallow, somewhat excessively drained and excessively drained soils on ridges and benches where the topography is influenced by the underlying bedrock. These soils formed in calcareous glacial till. Slope ranges from 0 to 15 percent but is dominantly 0 to 3 percent.

The Benson soils are near the Farmington, Wassaic, and Newstead soils. Benson soils have a higher content of coarse fragments in the subsoil than the similar Farmington soils, are shallower to bedrock than the moderately deep Wassaic soils, and are better drained than the Newstead soils. The Benson soils are also associated with the Honeoye, Cazenovia, and Lima soils but have a higher coarse fragment content and are shallower to bedrock than those soils.

Typical pedon of Benson very cherty loam, 0 to 3 percent slopes, in the town of Clarence, 0.2 mile southwest of the intersection of Kraus and Greiner Roads:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) very cherty loam; moderate fine granular structure; friable; many fine and medium roots; many pores; 50 percent coarse fragments; neutral; clear smooth boundary.

B2—6 to 12 inches; dark yellowish brown (10YR 4/4) very cherty loam; weak very fine subangular blocky structure; friable; common fine and medium roots; many pores; 50 percent coarse fragments; neutral; clear smooth boundary.

C—12 to 15 inches; brown (10YR 5/3) very cherty loam; massive; common fine roots; many pores; 55 percent coarse fragments; calcareous; mildly alkaline; abrupt irregular boundary.

R—15 inches; grayish cherty limestone; strong effervescence; material from above creeping into fractures.

The thickness of the solum ranges from 9 to 20 inches, and depth to bedrock ranges from 10 to 20 inches. Coarse fragments range from 35 to 55 percent by volume in the surface layer and from 30 to 65 percent in individual subhorizons of the subsoil and substratum. Coarse fragments average 35 percent or more by volume in the subsoil and substratum.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 2 or 3. Texture is very cherty loam or very cherty silt loam. Structure is moderate or strong, fine or medium granular. Consistence is friable or very friable. Reaction ranges from medium acid to neutral.

The B horizon commonly has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 6. It ranges from cherty loam to very cherty or very channery silt loam. Structure is weak to strong, fine or medium granular, or weak to medium, very fine, fine, or medium subangular or angular blocky. Consistence ranges from very friable to firm. Reaction ranges from slightly acid to mildly alkaline.

There is no C horizon in some pedons, but if there is one, it has hue of 10YR through 5Y, value of 4 or 5, and chroma of 3. It ranges from cherty loam to very channery silt loam. The C horizon is massive or has weak to moderate, subangular blocky structure, and it is friable or firm. It is neutral to mildly alkaline.

The R horizon is limestone or calcareous shale bedrock.

Blasdell series

The Blasdell series consists of deep, well drained soils on terraces, deltas, and beach ridges. These soils formed in outwash deposits dominated by fragments from local shale bedrock. Slope ranges from 0 to 25 percent but is dominantly 3 to 8 percent.

The Blasdell soils are in a drainage sequence with moderately well drained Farnham soils. They are similar to the Alton, Manlius, Marilla, and Chenango soils. Blasdell soils have a higher shale content in the subsoil than the Alton and Chenango soils, are deeper to bedrock than the Manlius soils, and do not have the fragipan layer of the Marilla soils.

Typical pedon of Blasdell shaly silt loam, 3 to 8 percent slopes, in the town of Hamburg, 0.5 mile west of the village of Hamburg and 1,000 feet south of Ridge Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) shaly silt loam; weak fine granular structure; very friable; many fine roots; 30 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21—8 to 15 inches; yellowish brown (10YR 5/6) very shaly silt loam; weak very fine subangular blocky structure; very friable; common fine roots; many pores; 60 percent coarse fragments; very strongly acid; clear smooth boundary.

B22—15 to 25 inches; yellowish brown (10YR 5/4) very shaly silt loam; weak fine subangular blocky structure; very friable; few fine roots; many pores; 60 percent coarse fragments averaging about 2 inches in diameter; very strongly acid; clear wavy boundary.

B23—25 to 36 inches; dark yellowish brown (10YR 4/4) very shaly loam; very weak fine subangular blocky structure; very friable; few roots in upper part; many pores; 60 percent coarse fragments mostly with rounded edges; strongly acid; gradual smooth boundary.

C—36 to 60 inches; brown (10YR 4/3) very shaly loam; massive; friable; pockets of sandy loam interspersed in the shaly strata; 70 percent coarse fragments; strongly acid.

The thickness of the solum ranges from 30 to 50 inches, and depth of bedrock ranges from 5 to 20 feet or more. Coarse fragments, dominantly shale, are 15 to 35 percent by volume in the A horizon, 35 to 65 percent in the B horizon, and 35 to 75 percent in the C horizon.

The Ap horizon has hue of 10YR through 2.5Y and chroma of 2 through 4. It is shaly silt loam or shaly loam. Structure is weak, fine granular to moderate, medium subangular blocky. Consistence is friable or very friable. Reaction ranges from very strongly acid through medium acid, unless the soil is limed.

The B horizon has hue of 7.5YR through 5Y. Texture is very shaly loam or very shaly silt loam, and structure ranges from very weak through moderate, fine or medium subangular blocky or granular. Consistence ranges from loose through firm, and reaction ranges from very strongly acid through medium acid.

The C horizon has hue of 10YR through 5Y, value of 3 through 5, and chroma of 2 through 4. The material is very shaly loam or very shaly silt loam. It is massive or single grain with loose, friable or firm consistence. Reaction ranges from strongly acid to slightly acid at depths of less then 80 inches.

Brockport series

The Brockport series consists of moderately deep, somewhat poorly drained soils on lowland plains where the topography is influenced by the underlying rock. These soils formed in glacial till. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Brockport soils are associated with the Remson, Churchville, Canadice, and Angola soils. They are more shallow to bedrock than the Remson, Churchville, and Canadice soils, and they have a finer textured subsoil than the Angola soils.

Typical pedon of Brockport silty clay loam, 3 to 8 percent slopes, in the town of Hamburg, 0.7 mile southeast of the hamlet of Wanakah, and 1,000 feet east of the intersection of Amsdel Road and the N7&W Railroad:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium granular structure; friable; many fine roots; 3 percent shale fragments; slightly acid; abrupt smooth boundary.

B21t—8 to 13 inches; olive brown (2.5YR 4/4) silty clay; many fine and medium distinct yellowish brown (10YR 5/6) and olive brown (10YR 4/4) mottles; strong medium blocky structure; firm, plastic and sticky when wet; grayish brown (2.5Y 5/2) silt coatings on vertical ped faces; dark grayish brown (2.5Y 4/2) clay films on horizontal ped faces and in pores; common fine roots; few medium pores; 3 percent fine shale fragments; slightly acid; clear wavy boundary.

B22t—13 to 23 inches, dark grayish brown (2.5Y 4/2) silty clay; many medium distinct olive (5Y 5/3) and yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure with some horizontal cleavage; firm, very plastic when wet; clay lining on ped faces and in pores; few fine roots; few medium pores; 5 percent fine shale fragments; neutral; clear wavy boundary.

C—23 to 31 inches; olive (5Y 4/3) shaly silt clay; common medium faint olive brown (2.5Y 4/4) and grayish brown (10YR 4/2) mottles; very weak platy structure; firm; few pores; 15 percent fine shale fragments; calcareous; mildly alkaline; clear smooth boundary.

IIR—31 inches; dark grayish brown (2.5Y 4/2) and dark olive (5Y 4/3) shale bedrock; calcareous.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Coarse fragments, mainly soft shale, range from few to 10 percent by volume in the A horizon and from few to 35 percent in the B and C horizons. There are also pebbles of sandstone and limestone, but they are not conspicuous in most pedons.

The Ap horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 1 or 2. It is silty clay loam or silt loam. Structure is granular or is subangular or angular blocky. Consistence is friable or firm. Reaction is medium acid to neutral. There is an A2g horizon in some pedons. It has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2.

The B2t horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 to 4. Some pedons have 5GY hue inherited from the parent material. Chroma is 1 or 2 on faces of peds but is 3, 4, or 5 in more than 40 percent of the matrix of some part of the B2t horizon. Texture ranges from clay to shaly silty clay loam. It has blocky or prismatic structure with distinct to prominent clay coatings on faces of peds. Consistence is firm or very firm and plastic or very plastic when wet. Reaction ranges from medium acid to mildly alkaline. The lower part of the B2t horizon is weakly calcareous in some pedons. There is a B3 horizon in some pedons.

The C horizon ranges from shaly clay to silty clay with very weak to moderate platy structure. Reaction is neutral to mildly alkaline. Most pedons are calcareous.

The underlying bedrock, or R horizon, ranges from neutral or calcareous shale to limestone or dolomite.

Canadice series

The Canadice series consists of deep, poorly drained soils in slight depressions of old glacial lake basins. These soils formed in glacial lake sediments having a high content of clay and are underlain by calcareous, shaly glacial till in some areas. Slope ranges from 0 to 3 percent.

The Canadice and the associated Rhinebeck soils formed in similar kinds of parent material, but the Canadice soils are slightly wetter. The Canadice soils are also associated with the Canandaigua, Collamer, and Niagara soils. They have a higher clay content in the subsoil than the Canandaigua soils, and they are not as well drained and have a higher clay content than the Collamer and Niagara soils.

Typical pedon of Canadice silt loam, in the town of Concord, near Zoar Valley Road, 500 feet north of Frye Bridge:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint brown (10YR 5/3) root stains; moderate fine granular structure; friable; many roots; neutral (limed); abrupt smooth boundary.

B21gt—8 to 25 inches; grayish brown (2.5Y 5/2) light silty clay; many (30 percent) fine distinct light olive brown (2.5Y 5/8) mottles; strong coarse prismatic structure parting to moderate medium angular blocky; firm, plastic, slightly sticky; common roots; grayish brown (10YR 5/2) clay films on ped faces; neutral; clear wavy boundary.

B22gt—25 to 38 inches; grayish brown (2.5Y 5/2) silty clay; many (30 percent) fine distinct yellowish brown (10YR 5/8) mottles; strong coarse prismatic structure parting to moderate medium angular blocky; firm, plastic, slightly sticky; common roots; gray (10YR 6/1) clay films on ped faces; neutral; clear wavy boundary.

B3g—38 to 53 inches; grayish brown (2.5Y 5/2) silty clay; many (40 percent) medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure; firm, plastic, slightly sticky; few roots; gray (10YR 5/1) ped faces; neutral; clear wavy boundary.

C—53 to 65 inches; dark grayish brown (10YR 4/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles and common medium distinct gray (10YR 5/1) mottles; massive; firm, plastic, slightly sticky; mildly alkaline; calcareous.

The thickness of the solum and depth to carbonates range from 36 to 60 inches. The depth to bedrock ranges from 5 feet to 30 feet or more. These soils are generally free of coarse fragments, but some pedons contain a small amount of fine gravel, usually as a surficial mantle. In areas where the substratum is glacial till, coarse fragment content ranges up to 35 percent by volume in these layers.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 to 4 when moist and 6 or more when dry, and chroma of 1 to 3. The Ap horizon is silt loam or silty clay loam. It is very strongly acid to slightly acid, unless limed.

The B horizon has ped faces with hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 0 to 2. Ped interiors have value of 4 or 5 and chroma of 1 or 2 and contain mottles with chroma of 4 or higher. Texture is clay, silty clay, or heavy silty clay loam. Structure is moderate to strong, coarse or very coarse prismatic or weak to moderate, medium or coarse angular blocky. Reaction is strongly acid to mildly alkaline.

The C horizon is similar in color and texture to the B horizon. Mottles are few to common and faint to distinct. This horizon generally is massive, but in places it has varves containing very fine sand. In some areas, glacial till is at a depth of about 3-1/2 feet. Texture of the till substratum is shaly clay to shaly silty clay loam. Reaction is mildly alkaline or moderately alkaline.

Canandaigua series

The Canandaigua series consists of deep, poorly drained and very poorly drained soils on lowland lake plains and in upland depressions. These soils formed in lake-laid deposits. Slope ranges from 0 to 3 percent.

The Canandaigua soils are in a drainage sequence with the better drained Collamer and Niagara soils. They are also associated with the Lamson, Lakemont, and Canadice soils. The Canandaigua soils do not have the sand content of the Lamson soils and have a lower clay content than the Lakemont and Canadice soils.

Typical pedon of Canandaigua silt loam, in the town of Clarence, located 0.5 mile east of the junction of Northfield and Wolcottsburg Roads:

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; very friable; many fine roots; many fine pores; neutral; abrupt smooth boundary.

B21g—9 to 11 inches; gray (10YR 5/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; distinct gray (2.5YR 5/1) ped faces; weak very coarse prismatic structure parting to weak medium subangular blocky; friable; many fine roots; common fine pores; neutral; abrupt wavy boundary.

B22g—11 to 25 inches; gray to grayish brown (10YR 5/1-5/2) silt loam; many medium distinct dark yellowish brown (10YR 4/4) and very strong brown (7.5Y 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium angular and subangular blocky, few fine roots; few fine pores; few thin clay films on ped faces and lining, few pores; neutral; clear wavy boundary.

B23g—25 to 37 inches; brown (7.5YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; ped faces indistinct light brownish gray (10YR 6/2); moderate medium blocky structure arranged in weak coarse plates within weak very coarse prisms; firm; few fine pores; few indistinct gray (10YR 5/1) clay films on ped faces and lining some pores; mildly alkaline; gradual irregular boundary.

C—37 to 60 inches; light brownish gray (10YR 6/2) silt loam; common distinct yellowish brown (10YR 5/4) mottles that become few and faint with depth; weak fine and medium platy structure; firm; moderately alkaline, calcareous.

The thickness of the solum ranges from 20 to 40 inches, and depth to carbonates ranges from 18 to 60 inches. Depth to bedrock is more than 5 feet. There are usually no coarse fragments, but they range up to 3 percent in some pedons. Ped faces in the B and C horizons are 2 or less in chroma.

The Ap or A1 horizon ranges from 10YR to 2.5Y in hue, is 2 or 3 in value, and is 1 or 2 in chroma. Value is 5 or less when the horizon is dry. It is silt loam, very fine sandy loam, or mucky silt loam. Reaction is medium acid to mildly alkaline.

The B horizon ranges from 5YR to 2.5Y in hue, from 4 to 6 in value, and from 1 to 2 in chroma. It is very fine sandy loam to silty clay loam with random subhorizons of lighter or heavier textures, but the average clay content in the 10- to 40-inch control section is between 18 and 35 percent. The B horizon has moderate or weak blocky structure that is within coarse or very coarse prisms in most places. The lower part of the B horizon has platy structure in some pedons. Common to many, distinct and prominent mottles occur in the B horizon. Reaction is slightly acid to mildly alkaline.

The C horizon has the same range in hue and value as the B horizon, but the range in chroma is from 1 to 4. Texture is silt loam or very fine sandy loam. Thin layers or bands that have a wide range in texture are in the C horizon of some pedons. Reaction ranges from neutral to moderately alkaline.

Castile series

The Castile series consists of deep, moderately well drained soils on terraces, outwash plains, and remnant deltas, mostly in the southern section of the county. These soils formed in glacial outwash deposits that have a high content of sand and gravel. Slope ranges from 0 to 8 percent.

The Castile soils formed in the same kind of material as the better drained Chenango soils. Also associated with the Castile soils are the Red Hook, Halsey, and Varysburg soils. The Castile soils are better drained than the Red Hook and Halsey soils and do not have the clayey substratum of the Varysburg soils.

Typical pedon of Castile gravelly loam, 3 to 8 percent slopes, in the town of Concord, 75 feet east of the B&O Railroad crossing and 660 feet south of Genesee Road:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) gravelly loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; very friable; many fine and very fine roots; 25 percent coarse fragments; medium acid; abrupt smooth boundary.

B21—8 to 19 inches; dark brown (10YR 4/3) gravelly loam; moderate medium subangular blocky structure; friable; common fine and few medium roots; 25 percent coarse fragments; medium acid; clear wavy boundary.

IIB22—19 to 31 inches; dark yellowish brown (10YR 4/4) very gravelly loam; few medium distinct light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure; very friable; common very fine roots; common coarse silt nodules with few coarse distinct strong brown (7.5YR 5/6) mottles; 55 percent coarse fragments; medium acid; gradual wavy boundary.

IIC—31 to 65 inches; brown (10YR 5/3) very gravelly sandy loam; single grain; loose; few fine roots; weakly stratified; 70 percent coarse fragments, 5 to 10 percent coarse fragments more than 3 inches in diameter; slightly acid.

The thickness of the solum ranges from 24 to 40 inches. Coarse fragments are mainly gravel, cobblestones, channery, and flagstones. They range from 15 to 35 percent by volume in the A horizon, 20 to 60 percent in the B horizon, and 35 to 70 percent in the C horizon.

The Ap horizon has a color hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3. Texture is gravelly loam or gravelly silt loam. Structure is weak or moderate granular. Reaction ranges from very strongly acid to medium acid.

The B2 horizon has color hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 or 4. Mottles of 2 chroma or less are at a depth of 15 to 24 inches. Texture ranges from gravelly silt loam to very gravelly sandy loam. Structure is granular or subangular blocky. Consistency is very friable or friable. There is a B3 horizon in some pedons. Reaction ranges from very strongly acid to medium acid in the B horizon.

The C horizon ranges from very gravelly loam to very gravelly sand. In some pedons, the C horizon is stratified. Reaction is strongly acid to neutral.

Cayuga series

The Cayuga series consists of deep, well drained and moderately well drained soils on lake plains in the northern part of the county. These soils formed in clayey glacial lake deposits over glacial till. Slope ranges from 3 to 15 percent but is dominantly 3 to 8 percent.

The Cayuga soils formed in the same kind of material as the associated somewhat poorly drained Churchville soils. The Cayuga soils are also near the Schoharie, Hudson, Collamer, and Odessa soils. The Cayuga soils have a thinner mantle of clayey lake-laid sediments than the Schoharie and Hudson soils, have a higher clay content than the Collamer soils, and are better drained than the Odessa soils.

Typical pedon of Cayuga silt loam, 3 to 8 percent slopes, in the town of Clarence, 3 miles northeast of Clarence Center and 10 feet west of Strickler Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A2—8 to 10 inches; brown (10YR 5/3) heavy silt loam; weak medium subangular blocky structure; friable; many fine roots; neutral; abrupt wavy boundary.

B2A—10 to 13 inches; brown (7.5YR 5/4) heavy silty clay loam; few fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; common fine roots; distinct clay films in pores; brown (10YR 5/3) moist, light gray (10YR 7/2) dry, 2 millimeters thick coatings on ped faces; neutral; gradual wavy boundary.

B2t—13 to 26 inches; reddish brown (5YR 4/3) silty clay; common fine and medium distinct strong brown (7.5YR 5/6-5/8) mottles; moderate medium and coarse angular blocky structure; common clay films on ped faces; firm; few fine roots; neutral clear wavy boundary.

IIC—26 to 60 inches; reddish brown (5YR 5/3) gravelly loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse platy structure; friable; few roots; 20 percent coarse fragments; calcareous; moderately alkaline.

The thickness of the solum ranges from 20 to 36 inches, and bedrock is deeper than 5 feet. Coarse fragments range from 0 to 10 percent by volume in the A and B horizon and from 10 to 50 percent in the C horizon.

The Ap horizon has a hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. When dry, the Ap horizon value is more than 5.5. Texture is silt loam or silty clay loam. Reaction ranges from medium acid to neutral. The A2 horizon has hue of 5YR through 2.5Y, value of 4 through 6, and chroma of 2 and 3. Structure is weak or moderate subangular blocky or platy. Consistence is friable or firm. Reaction is similar to that of the Ap horizon.

The B2t horizon has hue of 5YR to 2.5Y, value of 3 through 5, and chroma of 3 or 4. In pedons without a B&A horizon, the upper 2 to 4 inches of the B horizon has ped coatings 1 to 2 millimeters thick, which have dry colors with value of 7 or 8 and chroma of 2 or 3. Texture ranges from silty clay to clay. Clay content averages more than 35 percent in the B horizon. Structure is moderate or strong. The B2t horizon is unmottled in some pedons. Reaction ranges from medium acid to mildly alkaline.

The IIC horizon has hue of 5YR through 2.5Y, value of 3 through 5, and chroma of 2 through 4. Texture of the fine earth portion is fine sandy loam, loam, or silty clay loam. Reaction ranges from neutral through moderately alkaline. There are free carbonates in most pedons.

Cazenovia series

The Cazenovia series consists of deep, well drained and moderately well drained soils on glacial till plains. These soils formed in glacial till and reglaciated lake-laid sediments. Slope ranges from 3 to 15 percent but is dominantly 3 to 8 percent.

The Cazenovia and the associated Ovid, Odessa, and Churchville soils formed in similar parent material, but the Cazenovia soils are better drained than those soils. They are associated with the Honeoye, Lima, and Wassaic soils. The Cazenovia soils have a higher clay content and are redder than the Honeoye and Lima soils. They are deeper to bedrock than the Wassaic soils.

Typical pedon of Cazenovia silt loam, 3 to 8 percent slopes, in the town of Clarence, 0.1 mile west of the intersection of Roll Road and Goodrich road:

Ap—0 to 9 inches; dark brown (7.5YR 4/2) silt loam; moderate fine and medium granular structure; friable; many fine roots; many fine pores; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2—9 to 11 inches; pinkish gray (7.5YR 6/2) silt loam; few fine faint brown (7.5YR 5/4) mottles; moderate medium granular structure; friable; many fine roots; many fine pores; 10 percent coarse fragments; slightly acid; clear irregular boundary.

B&A—11 to 14 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; interfingering of pinkish gray (7.5YR 6/2) silt loam material from the A2 horizon along vertical ped faces; friable; common fine roots; common fine pores; clay films coating pores in ped interiors; 10 percent coarse fragments; neutral; clear wavy boundary.

B21t—14 to 20 inches, reddish brown (5YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; few fine roots; common fine pores; moderately thick reddish brown (5YR 5/3) clay films on ped faces and in pores; 10 percent coarse fragments; neutral; gradual smooth boundary.

B22t—20 to 32 inches; reddish brown (5YR 4/3) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine pores; moderately thick reddish brown (5YR 5/3) clay films along vertical and horizontal ped surfaces and in pores; 10 percent coarse fragments; mildly alkaline; gradual smooth boundary.

C—32 to 60 inches; reddish brown (5YR 5/3) gravelly silty clay loam; massive; firm; 20 percent coarse fragments; calcareous moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches and corresponds with the depth to carbonates in most pedons. Bedrock is deeper than 60 inches. Coarse fragments range from 2 to 15 percent by volume in the A horizon, 2 to 25 percent in the B horizon, and 10 to 35 percent in the C horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. Dry color value is more than 5.5. Texture is silt loam, loam, or fine sandy loam. Reaction ranges from medium acid to neutral. There is no A2 horizon in some pedons, but if there is one, it has hue of 10YR to 5YR, value of 5 or 6, and chroma of 2 or 3. The A2 horizon interfingers into the upper part of the B horizon.

The B2t horizon ranges from 7.5YR to 2.5YR in hue, 3 to 5 in value, and 3 or 4 in chroma. It has high-chroma mottles in places. It is clay loam or silty clay loam or the gravelly analogs of those textures. Some subhorizons have silty clay textures. Average clay content is 28 to 35 in the B horizon. Structure is moderate or strong. Reaction ranges from medium acid to neutral in the upper part, and pH increases with depth. There is a B3 horizon in some pedons.

The C horizon has colors similar to those of the B horizon. It is loam, silt loam, or silty clay loam or the gravelly analogs of those textures. It is massive or has platy structure. This horizon is firm or very firm and ranges from neutral to moderately alkaline. There are mottles in the C horizon of some pedons.

Cheektowaga series

The Cheektowaga series consists of deep, poorly drained and very poorly drained soils in low depressional areas of lake plains. These soils formed in sandy lake-laid sediments that are underlain by deposits with a high clay content. Slope ranges from 0 to 3 percent.

The Cheektowaga soils are in a drainage sequence with the Claverack and Cosad soils but are more poorly drained than these soils. They are also associated with the Colonie, Elnora, Minoa, and Lamson soils. The Cheektowaga soils do not have the deep sandy deposits and are not as well drained as the Colonie and Elnora soils. They do not have the loamy textures of the better drained Minoa soils and the similarly drained Lamson soils.

Typical pedon of Cheektowaga fine sandy loam, in an idle field in the town of Clarence, 2.2 miles northeast of the village of Clarence Center and 1.7 miles east of New York Highway 73:

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam, gray (10YR 5/1) dry; moderate very fine granular structure; very friable; many fine roots; many fine pores; neutral; abrupt smooth boundary.

A2g—9 to 15 inches; gray (10YR 5/1) loamy fine sand; few fine distinct light olive brown (2.5Y 5/4) mottles; very weak very fine granular structure; very friable; few fine roots; few fine pores; neutral; abrupt smooth boundary.

B21g—15 to 22 inches; grayish brown (10YR 5/2) loamy fine sand; common fine distinct yellowish brown (10YR 5/6) mottles; very weak fine subangular blocky structure; very friable; few fine roots; common pores; slightly acid; clear smooth boundary.

B22g—22 to 26 inches; brown (7.5YR 4/2) loamy fine sand; many medium distinct yellowish brown (10YR 5/6) and coarse faint grayish brown (10YR 5/2) mottles; very weak very thick platy structure; friable; common pores; neutral; abrupt wavy boundary.

IIC1—26 to 33 inches; dark brown (7.5YR 4/2) varved silty clay loam; many medium distinct strong brown (7.5YR 5/8) and common medium distinct gray (10YR 5/1) mottles; weak medium platy structure; firm, plastic; few fine pores; calcareous; mildly alkaline; gradual smooth boundary.

IIIC2—33 to 60 inches; reddish brown (5YR 4/3) varved silty clay, common medium distinct brown (7.5YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium platy structure; firm; few fine pores; calcareous; moderately alkaline.

The thickness of the solum and depth to the underlying fine textured material range from 20 to 40 inches. Depth to bedrock is more than 60 inches. The soil contains few or no coarse fragments.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. Texture is fine sandy loam or sandy loam. Structure is weak or moderate, fine or very fine granular. Reaction is medium acid to neutral. The A2g horizon is neutral in color or has hue of 10YR or 2.5Y, value of 4 through 6, chroma of 1 or 2, and it is mottled. Texture ranges from loamy fine sand to sand. Structure is very weak or weak, very fine or fine granular. Consistence is friable or very friable. Reaction is medium acid to neutral.

The B2 horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 1 through 3. Texture ranges from loamy fine sand to sand. Structure is very weak or weak, fine or medium subangular blocky or very weak or weak, medium through very thick platy. Consistence is friable or very friable. Reaction is medium acid to neutral in the upper part of the B2 horizon but can range to moderately alkaline in the lower part just above the C horizon.

The IIC and IIIC horizons have hue of 5YR through 2.5Y, value of 4 or 5, and chroma of 1 through 4. They have common or many, high- and low-chroma mottles. Texture ranges from silty clay loam to clay and is more than 35 percent clay. These horizons are massive, or they have medium or thick platy structure in depositional varves. Reaction is neutral to moderately alkaline.

Chenango series

The Chenango series consists of deep, well drained to somewhat excessively drained soils on outwash plains and associated moraines, terraces, deltas, remnant beaches, and alluvial fans. These soils formed in water sorted deposits. Slopes ranges from 0 to 50 percent but is dominantly 0 to 8 percent.

The Chenango soils are associated in a drainage sequence with the moderately well drained Castile soils and the somewhat poorly drained Red Hook soils. These soils all formed in similar material. The Chenango soils are also associated with the Allard, Alton, Valois, and Varysburg soils. The Chenango soils do not have the thick silty mantle of the Allard soils and are more acid than the Alton soils. They have a well-sorted gravelly substratum, which contrasts with the random sorting in the substratum of the Valois soils, and they do not have the clayey layers that are in the substratum of the Varysburg soils.

Typical pedon of Chenango gravelly loam, 3 to 8 percent slopes, in an idle field in the town of Concord, 1 mile south of New York Highway 39 and 0.5 mile west of the Hoffman Road:

Ap—0 to 8 inches; dark brown (10YR 3/3) gravelly loam, very pale brown (10YR 7/3) crushed and dry; weak to moderate fine granular structure; very friable; many fine roots; 30 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21—8 to 13 inches; yellowish brown (10YR 5/4) gravelly loam; weak medium subangular blocky and moderate fine granular structure; very friable; common fine roots; common medium pores; 34 percent coarse fragments; strongly acid; clear wavy boundary.

B22—13 to 22 inches; dark brown (10YR 4/3) very gravelly loam; weak fine and medium subangular blocky structure; friable; common fine roots; common medium pores; 40 percent coarse fragments; strongly acid; gradual wavy boundary.

B23—22 to 30 inches; dark brown (10YR 4/3) very gravelly loam; weak medium subangular blocky structure; friable; few fine roots; common fine pores; 50 percent coarse fragments; strongly acid; gradual wavy boundary.

IIC—30 to 60 inches; dark brown (10YR 4/3) and light brownish gray (10YR 6/2) very gravelly loamy sand; single grain; friable, firm in place; 60 percent coarse fragments, mainly gravel and some cobblestones; strongly acid.

The thickness of the solum ranges from 24 to 36 inches. Bedrock is at a depth of 5 to 50 feet or more. Coarse fragments are mainly gravel, but they also include cobblestones, channery fragments, and flagstones. The volume of coarse fragments ranges from 15 to 30 percent in the A horizon, from 20 to 60 percent in the B horizon, and from 30 to 70 percent in the C horizon. It averages more than 35 percent between depths of 10 and 40 inches.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 or 3. The Ap horizon is loam, silt loam, or fine sandy loam and the gravelly or channery analogs of those textures. Reaction is strongly acid or very strongly acid.

The B horizon has hue of 2.5Y to 7.5YR, value of 4 or 5, and chroma of 3 through 6. Chroma is more than 4 only in the topmost parts of the B horizon in some profiles. The B horizon is fine sandy loam, loam, or silt loam and the gravelly, channery, very gravelly, or very channery analogs of those textures. The sand content generally increases as depth increases. The B horizon has very weak or weak subangular blocky structure or very weak granular structure. Consistence is very friable to slightly firm. Reaction is very strongly acid to medium acid.

The C horizon is stratified with various sizes of sand and gravel. The fine earth fraction ranges from coarse sand to loamy fine sand. This horizon becomes less acid as depth increases, but reaction is strongly acid to a depth of at least 40 inches. It ranges to mildly alkaline below 40 inches in some pedons.

Chippewa series

The Chippewa series consists of deep, poorly drained soils that formed in glacial till dominated by siltstone, sandstone, and shale fragments. Slope ranges from 0 to 3 percent.

The Chippewa soils formed in the same kind of parent material as the associated better drained Mardin, Erie, Langford, and Volusia soils. The Chippewa soils are similar to the Lyons and Ilion soils but differ from these soils in having a fragipan.

Typical pedon in Chippewa silt loam, in the town of Concord, 0.7 mile east of New York Highway 240, and 800 feet north of Genesee Road:

A1—0 to 7 inches; very dark gray (10YR 3/1) silt loam; weak medium granular structure; friable; many fine roots; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2g—7 to 13 inches; grayish brown (2.5Y 5/2) silt loam; common fine and medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; common fine roots; few fine pores; 10 percent coarse fragments; slightly acid; clear wavy boundary.

Bxg—13 to 36 inches; dark grayish brown (2.5Y 4/2) channery silt loam; common medium distinct yellowish brown (10YR 6/2) mottles; moderate prisms 5 to 15 inches in diameter that become weaker and larger with depth; 1/2- to 1-1/2 inch-wide gray (10YR 5/1-6/1) streaks with thin brown (7.5YR 5/4) borders surround prisms; weak medium and coarse subangular blocky structure within prisms; firm; brittle; few roots in upper part; common fine pores lined with grayish brown (2.5Y 5/2) clay films; few clay coatings on ped faces in lower part; 20 percent coarse fragments, increasing in amount with depth; neutral; gradual wavy boundary.

Cg—36 to 60 inches; very dark grayish brown (2.5Y 3/2) channery silt loam; few fine and medium distinct yellowish brown (10YR 5/4) mottles; weak medium and thick platy structure; very firm; very few pores; 25 percent coarse fragments; weakly calcareous; mildly alkaline.

The thickness of the solum ranges from 36 to 56 inches. Depth to the top of the fragipan ranges from 8 to 20 inches. Bedrock is deeper than 5 feet. Coarse fragments range from 0 to 15 percent in the A horizon and from 20 to 50 percent in Bx and C horizons.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 1 or 2. It is a loam or silt loam. Reaction is very strongly acid to slightly acid. The A2 horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 0 through 2, and it is mottled. It is loam or silt loam. The A2 horizon has very weak to moderate, fine or medium subangular blocky structure, or the material is massive. It is friable or firm. In some pedons the A2 horizon is partially or wholly replaced by a mottled Bg horizon with texture similar to the A2g horizon. Reaction is very strongly acid to slightly acid.

The Bx horizon has hue of 10YR through 5Y, value of 3 through 6, and chroma of 1 or 2, except in some pedons where subhorizons below a depth of 30 inches have chroma of 3 or 4. The Bx horizon ranges from light silty clay loam to fine sandy loam and the channery or very channery analogs of those textures. It has moderate or strong prismatic structure parting to very weak to moderate subangular blocky, or the material within the prisms is massive. The horizon is firm or very firm, and it is brittle. Reaction is strongly acid to neutral.

The Cg horizon is similar to the Bx horizon in color and texture. This horizon is massive or has weak or moderate platy structure. It is firm or very firm. Reaction is medium acid to moderately alkaline.

Churchville series

The Churchville series consists of deep, somewhat poorly drained soils that formed in thin deposits of fine textured glacial lake sediments underlain by glacial till. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Churchville soils are in a drainage sequence with the better drained Cayuga soils. They are also associated with the Odessa, Lakemont, Remson, Darien, and Rhinebeck soils. The Churchville soils have thinner deposits of clayey sediments than the Odessa, Remson, and Rhinebeck soils, and they are better drained than the Lakemont soils. They have more clay in the subsoil than the Darien soils that occur on adjacent glacial till landforms.

Typical pedon of Churchville silt loam, 0 to 3 percent slopes, in the town of Clarence, 500 feet north of the junction of Connor and County Roads, northwest of the hamlet of Clarence Center:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; slightly hard, friable; abundant fine roots; many pores; neutral; abrupt smooth boundary.

A2—9 to 11 inches; pinkish gray (7.5YR 6/2) silt loam; common fine faint gray (10YR 5/1) and medium distinct strong brown (7.5YR 5/6) mottles; weak medium subanglar blocky structure; friable; abundant fine roots; many pores; slightly acid; clear smooth boundary.

B&A—11 to 15 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; pinkish gray (7.5YR 6/2) silt loam interfingering between peds and occuring as thin horizontal lamellae make up 12 percent of the cross section; pores inside peds have clay film linings; neutral; clear wavy boundary.

B2t—15 to 26 inches; reddish brown (5YR 4/3) silty clay; common medium distinct yellowish red (5YR 5/6) and light gray (10YR 6/1) mottles; moderate medium blocky structure; firm, sticky; few fine roots in upper part; common fine pores; dark reddish gray (5YR 4/2) ped faces; continuous clay films on vertical and horizontal ped faces and lining all pores; mildly alkaline; clear smooth boundary.

IIC—26 to 60 inches; reddish gray (5YR 5/2) gravelly loam; few medium distinct brown (7.5YR 5/4) mottles; moderate thick platy structure; very firm; few fine pores; 25 percent coarse fragments; calcareous; moderately alkaline.

The thickness of the solum and depth to the IIC horizon range from 20 to 36 inches. Depth to bedrock is more than 60 inches. The volume of coarse fragments ranges from none to 5 percent in the A and B horizons and from 10 to 35 percent in the IIC horizon. Hues in the solum range from 5YR to 2.5Y. Dominant chroma of more than 2 occur in some subhorizons between the Ap horizon and 30 inches.

The Ap horizon has moist value of 3 through 5 and dry value of 6 or 7 and chroma of 2 or 3. Texture is silt loam or silty clay loam. Reaction is medium acid to neutral. If there is an A2 horizon, it has value of 4 through 6 and chroma of 2 through 4 with common to many mottles of higher and lower chroma. Texture will be silt loam or silty clay loam. Structure will be weak or moderate blocky or platy. Consistence will be friable or firm, and reaction ranges from medium acid to neutral.

The B&A horizon has ped coatings similar in color and texture to those of the A2 horizon. Ped interiors have color value of 4 or 5 and chroma of 2 through 4. The B2t horizon has ped coatings with chroma of 2 or less. Ped interiors of the B2t horizon have value of 4 or 5, and chroma of 3 or 4, and mottles of higher and lower chroma which range from few to many and from faint to distinct. Texture is clay loam, silty clay loam, or silty clay. Structure is moderate to strong, medium to coarse blocky. Clay films range from patchy to continuous on both horizontal and vertical ped faces. The B2t horizon is slightly acid to mildly alkaline.

The IIC horizon is loam, silt loam, or light silty clay loam or the gravelly analogs of those textures. Mottles are few or common and faint or distinct. Consistence is firm or very firm. Reaction ranges from mildly alkaline to moderately alkaline.

Claverack series

The Claverack series consists of deep, moderately well drained soils on remnant deltas and glacial lake plains. These soils formed in sandy deposits and in the underlying clayey lake-laid sediments. Slope ranges from 0 to 8 percent.

The Claverack soils formed in the same kind of parent material as the associated somewhat poorly drained Cosad soils and the poorly drained to very poorly drained Cheektowaga soils. The Claverack soils are also associated with the Arkport, Galen, Minoa, and Elnora soils but are underlain by clayey deposits, unlike those soils.

Typical pedon of Claverack loamy fine sand, 0 to 3 percent slopes, in the town of Clarence, 0.3 mile west of Newhouse Road, 45 feet north of Roll Road, and 96 feet west of NYSE&G pole No. 5:

Ap—0 to 10 inches; dark brown (10YR 3/3) loamy fine sand; very weak fine granular structure; very friable; many fine and medium roots; medium acid; abrupt smooth boundary.

B21—10 to 21 inches, strong brown (7.5YR 5/6) loamy fine sand; few fine and medium faint reddish brown (5Y 4/4) iron nodules with darker centers; very weak coarse platy structure; very friable; many fine roots and pores; medium acid; clear wavy boundary.

B22—21 to 31 inches; brown (7.5YR 5/4) loamy fine sand; few fine and medium distinct yellowish red (5YR 5/6-5/8) and pale brown (10YR 6/3) mottles; very weak subangular blocky structure; very friable; few medium faint reddish brown (5YR 4/4) iron nodules; common fine roots; many fine pores; slightly acid; abrupt wavy boundary.

B23—31 to 35 inches; dark brown (7.5YR 4/4) fine sandy loam; few fine faint light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; very friable; few fine roots; common fine pores; neutral; clear wavy boundary.

IIB3—35 to 45 inches; dark brown (7.5YR 4/2) clay; many fine and medium distinct yellowish red (5Y 5/6) and gray (5YR 5/1) mottles; weak coarse prismatic structure that parts to moderate medium subangular blocky; firm; few roots and pores; neutral; clear wavy boundary.

IIC—45 to 60 inches; reddish brown (5YR 4/3) clay; common medium and coarse distinct strong brown (7.5YR 5/6) and gray (5YR 5/1) mottles; moderate thick platy structure; firm, sticky; few fine pores with thin clay linings; common streaks of pinkish gray (7/5YR 7/2) lime, segregated on plate faces; calcareous; moderately alkaline.

The depth to the underlying fine textured sediments ranges from 20 to 40 inches. This soil is free or nearly free of coarse fragments. Depth to bedrock is more than 60 inches.

The Ap horizon is dominantly 10YR in hue, 3 or 4 in value, and 2 or 3 in chroma. Texture is mainly loamy fine sand and some areas of fine sand or sand. Reaction ranges from strongly acid to neutral.

The B2 horizon ranges from 2.5Y to 7.5YR in hue, from 4 to 6 in value, and from 3 to 6 in chroma. In some places, yellowish red to red iron nodules occur in the B horizon. Mottles are few to many and faint or distinct, and their chroma are higher than those of the matrix. In some places, the lower part of the B2 horizon has gray or grayish brown mottles below a depth of 18 inches. Texture is loamy fine sand, fine sand, or sand. There are commonly thin layers of fine sandy loam in the lower part of the horizon. Reaction is strongly acid to neutral.

The IIB3 horizon, where there is one, and the IIC horizon range from 2.5YR to 5Y in hue, from 3 to 5 in value, and from 2 to 4 in chroma. Texture of these horizons is clay, silty clay, or heavy silty clay loam; clay content is more than 35 percent. The IIC horizon is massive or has moderate medium or thick platy structure inherited from the parent material. Reaction is neutral to moderately alkaline. There are free carbonates in some pedons.

In the survey area these soils are taxadjuncts to the Claverack soils because there is a IIB3 horizon that has soil structure in the upper part of the clayey deposits and because the lower part of the B2 horizon has sandy loam textures. These differences do not affect the use and management of the soil.

Collamer series

The Collamer series consists of deep, moderately well drained soils on the lowland lake plain. These soils formed in glacial lake sediments dominated by silt and very fine sand. In some areas, these soils are underlain with a glacial till substratum. Slope ranges from 0 to 15 percent but is dominantly 3 to 8 percent.

The Collamer soils formed in the same kind of material as the associated Niagara and Canandaigua soils but are better drained. They are also associated with the Raynham, Scio, Schoharie, and Rhinebeck soils. The Collamer soils have a higher clay content and are better drained than the Raynham soils, are not as acid as the Scio soils, and have a lower clay content and are not as red as the Schoharie soils. They are better drained and coarser textured than the Rhinebeck soils.

Typical pedon of Collamer silt loam, 3 to 8 percent slopes, in the town of Amherst, near Tonawanda Creek Road and 0.7 mile east of New York Highway 270:

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

A2—10 to 12 inches; pale brown (10YR 6/3) light silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak thin platy structure; firm; many roots; many fine pores; slightly acid; clear wavy boundary.

B&A—12 to 15 inches; brown (7.5YR 4/4) silt loam; common fine distinct brown (7.5YR 5/4) mottles; weak fine and medium subangular blocky structure; firm; common fine roots; many fine pores; clay films lining many pores within darker brown areas; pale brown (10YR 6/3) light silt loam similiar to material in A2 horizon surrounding peds; slightly acid; clear irregular boundary.

B21t—15 to 20 inches; brown (7.5YR 4/4) heavy silt loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; firm; common fine roots; common fine pores with clay films lining most pores and along some ped faces; pale brown (10YR 6/3) similar to material in A2 horizon extending along some vertical ped faces; neutral; clear wavy boundary.

B22t—20 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct strong brown (7.5YR 5/6) and pinkish gray (7.5YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; clay films lining all pores and on many ped faces; neutral in upper part, mildly alkaline in lower part; clear wavy boundary.

C—32 to 60 inches; brown (7.5YR 5/2) silt loam with varves of very fine sand and silty clay loam occupying 25 percent of the horizon; common medium and coarse faint strong brown (7.5YR 5/6) mottles; moderate medium platy structure; firm; streaks of pinkish gray (7.5YR 7/2) lime segregated on some plate faces; weakly calcareous; mildly alkaline.

The thickness of the solum and depth to carbonates range from 24 to 48 inches. These soils are typically free of coarse fragments, but a few stones or pebbles are as much as 5 percent of some profiles. Bedrock is at a depth of more than 60 inches and, typically, is deeper than 6 feet.

The Ap horizon has a hue of 10YR or 7.5YR, value of 3 to 5 when moist, and chroma of 2 or 3. The A2 horizon has a value of 5 or 6 and chroma of 3 or 4. Mottles are few to common. The A horizon ranges from fine sandy loam to silt loam. Reaction ranges from strongly acid to neutral.

In the B&A horizon, the A part is similar in range in color and texture to the A2 horizon, and the B part has the same range in color as the Bt horizon immediately below this horizon.

The Bt horizon has hue of 5YR to 2.5Y, value of 4 or 5, and chroma of 3 or 4. Mottles are few to common and faint to distinct. There are mottles with chroma of 2 or less within 10 inches of the top of the Bt horizon. The Bt horizon is silt loam or silty clay loam and has an average clay content ranging from 18 to 35 percent. Reaction is medium acid to mildly alkaline.

The C horizon has hue of 2.5Y to 5YR, value of 4 or 5, and chroma of 2 to 4. It is stratified silt, very fine sand, and silty clay loam. Glacial till occurs at a depth of 3-1/2 feet to 5 feet in some pedons. The C horizon is slightly acid to moderately alkaline.

Colonie series

The Colonie series consists of deep, well drained to somewhat excessively drained soils on remnant beaches, sandbars, and deltas of glacial lakes and on dunelike landforms. These soils formed in lake-laid or windblown deposits dominated by fine sand. Slope ranges from 3 to 15 percent but is dominantly 3 to 8 percent.

The Colonie soils formed in the same kind of material as the associated moderately well drained Elnora soils.

They are also associated with the Arkport, Galen, and Minoa soils. The Colonie soils do not have the thick clay-enriched lamellae that are in the Arkport soils an are better drained than the Galen and Minoa soils.

Typical pedon of Colonie loamy fine sand, 3 to 8 percent slopes, in the town of Newstead, off Crego Road, 1 mile west of Sand Hill community:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; very friable; strongly acid; abrupt smooth boundary.

B21—7 to 13 inches; strong brown (7.5YR 5/6) loamy fine sand; very weak very fine granular structure; very friable; many fine roots; many pores; strongly acid; clear wavy boundary.

B22—13 to 28 inches; yellowish brown (10YR 5/4) loamy fine sand; very weak very fine granular structure; very friable; few common fine roots; common fine pores; strongly acid; gradual wavy boundary.

B23—28 to 60 inches; pale brown (10YR 6/3) fine sand, brown (7.5YR 4/4) 1/2-inch bands of loamy fine sand and fine sandy loam that are 2 to 10 inches apart; bands are friable while soil between them is loose and single grain; medium acid; gradual smooth boundary.

C—60 to 70 inches; light grayish brown (10YR 6/2) fine sand, some thin strata of medium sand; structureless; single grain; very friable; slightly acid.

The thickness of the solum ranges from 48 to 65 inches. Bedrock is at a depth of more than 60 inches. There are generally no coarse fragments, but fine gravel can occupy up to 3 percent by volume of some horizons.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. It is loamy fine sand or fine sand. Structure is weak or very weak granular. Reaction is strongly acid to slightly acid.

The B horizon has hue of 10YR through 5YR, value of 4 through 6, and chroma of 3 through 6 which decreases with depth. The B horizon is loamy fine sand or fine sand, but some pedons contain thin subhorizons of very fine sand. It is single grain or has very weak, fine, granular structure and is very friable or loose. Reaction is strongly acid to slightly acid. Below a depth of 24 inches, the soil contains darker color lamellae 1/16 to 3 inches thick that are friable to firm. They total less than 6 inches in thickness. Some of these thin lamellae, or horizontal bands, contain slightly more clay than the soil above or below them. The lamellae have hue of 7.5YR or 5YR, value of 3 through 5, and chroma of 3 or 4.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. It is loamy fine sand or fine sand. The C horizon is mottled in some places below a depth of 45 inches. Contrasting layers of silt, clay, or gravel occur below a depth of 48 inches in some pedons.

Cosad series

The Cosad series consists of deep, somewhat poorly drained soils in nearly flat areas of glacial lake plains. These soils formed in sandy sediments and in the underlying clayey lake-laid deposits. Slope ranges from 0 to 3 percent.

The Cosad soils are in a drainage sequence with the moderately well drained Claverack soils and the poorly drained to very poorly drained Cheektowaga soils. They are near the Colonie, Elnora, Rhinebeck, and Schoharie soils. The Cosad soils are underlain by clayey deposits and are not as well drained as the Colonie and Elnora soils. They have a sandy surface mantle that the Rhinebeck and Schoharie soils do not have.

Typical pedon of Cosad loamy fine sand, in the town of Amherst, 0.2 mile south of Dodge Road and 100 feet east of Casey Road:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand; moderate fine granular structure; very friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

B21—9 to 21 inches; yellowish brown (10YR 5/4) loamy fine sand; common coarse distinct strong brown (7.5YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; very weak coarse subangular blocky structure; very friable; common roots; slightly acid; clear wavy boundary.

B22—21 to 24 inches; brown (7.5YR 5/4) fine sandy loam; many medium distinct strong brown (7.5YR 5/8) and common medium distinct light grayish brown (10YR 6/2) mottles; weak coarse subangular blocky structure; friable; common fine roots; neutral; abrupt wavy boundary.

IIB3—24 to 32 inches; brown (7.5YR 5/4) silty clay; common fine distinct light gray (7.5YR 6/0) and strong brown (7.5YR 5/8) mottles; coarse prismatic structure parting to moderate coarse angular blocky; firm; few very fine roots; slightly effervescent; mildly alkaline; clear wavy boundary.

IIC—32 to 60 inches; reddish brown (5YR 5/3) and brown (7.5YR 5/2) silty clay; massive; firm; plastic and sticky; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 18 to 36 inches. The sandy mantle underlain by the clayey deposits is 18 to 40 inches thick. Depth to bedrock is more than 60 inches. These soils are generally free of coarse fragments.

The Ap or A1 horizon has hue of 10YR or 2.5Y or is neutral, has value of 2 or 3, and has chroma of 0 to 2. It is loamy fine sand, fine sand, or sand. The A horizon has weak or moderate granular structure and very friable or friable consistence. Reaction ranges from strongly acid to slightly acid.

The B2 horizon has hue of 5YR through 2.5Y, value of 4 through 6, and chroma of 2 through 4. It has few to common mottles of higher and lower chroma; those with chroma of 2 or less are above a depth of 18 inches. Texture is loamy fine sand or coarser; however, thin subhorizons of very fine sand, loamy very fine sand, or fine sandy loam are in some pedons. Reaction ranges from strongly acid to neutral.

The IIC and IIB3 horizons have hue of 2.5YR through 5GY, value of 3 to 6, and chroma of 1 through 4. They range from heavy silty clay loam through clay. The IIC horizon is massive or varved; the IIB3 horizon differs from the IIC horizon by having a blocky or prismatic structure. Below a depth of 40 inches, there is a thin layer of silt and very fine sand in some pedons. Reaction ranges from netural to moderately alkaline.

In the survey area, these soils are taxadjuncts to the Cosad series because the structural development in the upper part of the underlying clayey deposits and the fine sandy loam textures in the lower part of the B2 horizon are outside the difinitive range for the series. These differences do not affect the use and management of the soils.

Danley series

The Danley series consists of deep, moderately well drained soils on till plains in the central and north-central parts of the county. These soils formed in shaly glacial till deposits. Slope ranges from 3 to 25 percent but is dominantly 3 to 8 percent.

The Danley soils formed in the same kind of parent material as the somewhat poorly drained Darien soils. They are associated with the Langford, Remsen, Aurora, and Niagara soils. The Danley soils are finer textured than the Langford soils and do not have the fragipan. They are not so clayey as the Remsen soils, are deeper to bedrock than the Aurora soil, and contain more coarse fragments and are better drained than the Niagara soils.

Typical pedon of Danley silt loam, 3 to 8 percent slopes, in the town of Alden, 50 feet west of Sullivan Road and 250 feet north of hedgerow at center of hilltop:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

A2—5 to 10 inches; yellowish brown (10YR 5/4) silt loam; few fine faint light olive brown (2.5Y 5/4) mottles; moderate coarse subangular blocky structure; friable; common roots; 5 percent coarse fragments; neutral; clear wavy boundary.

B2t—10 to 26 inches; dark brown (10YR 4/3) silty clay loam; common medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; moderate coarse blocky structure; friable; common roots; brown (10YR 5/3) clay films lining pores and on ped faces; 5 percent coarse fragments; slightly acid; clear wavy boundary.

B3—26 to 36 inches; olive (5Y 5/3) silty clay loam; common medium distinct brownish yellow (10YR 6/3) and light brownish gray (2.5Y 5/2) mottles; weak medium subangular blocky structure; firm; clay films lining pores; 14 percent coarse fragments that are 1/2 inch to 2 inches in diameter; mildly alkaline; clear wavy boundary.

C—36 to 60 inches; grayish brown (2.5Y 5/2) shaly clay loam; few fine distinct light gray (2.5Y 7/0) and olive yellow (2.5Y 6/6) mottles; massive; firm; 25 percent coarse fragments, 5 percent more than 3 inches in diameter; calcareous; mildly alkaline.

The thickness of the solum and depth to carbonates range from 30 to 60 inches. Coarse fragments range from 3 to 15 percent by volume of the A horizon to as much as 35 percent of the lower part of the B horizon and up to 60 percent of the C horizon. Depth to bedrock ranges from 5 feet to many feet. The bedrock is mainly gray to black, calcareous shale of variable hardness.

The Ap or A1 horizon has hue of 2.5Y or 10YR, value of 3 through 5, and chroma is 2. Texture ranges from loam to silty clay loam but is dominantly silt loam. Reaction ranges from strongly acid to slightly acid. There is no A2 horizon in some pedons that have been deeply plowed. The A2 horizon ranges in hue from 5Y through 10YR, in value from 4 thorugh 6, and in chroma from 2 through 4. Mottles range from none to common, from faint to distinct, and have chroma higher than the matrix. Texture ranges from loam to silty clay loam, structure is platy or blocky, and consistence is friable or firm. Small pockets similar to the B horizon range from none to 20 percent of the A2 horizon. Reaction ranges from strongly acid to slightly acid.

The B horizon matrix has hue of 5Y through 10YR, value of 4 or 5, and chroma of 2 to 4. It has mottles of both high and low chroma. It is clay loam or silty clay loam or the shaly analogs of those textures. Average clay content of the B horizon ranges from 27 to 35 percent, but individual subhorizons have a clay content above or below these limits. Structure is weak to moderate, fine to coarse blocky. Reaction ranges from medium acid to neutral in the Bt horizon and, in places, can range to mildly alkaline in the B3 horizon.

The C horizon ranges from loam to silty clay loam of the shaly or very shaly analogs of those textures. It has hue of 10YR to 5Y, value of 4 or 5, and chroma of 2 to 4. Reaction is mildly alkaline or moderately alkaline.

In this survey area, the Danley soils are taxadjuncts to the Danley series because they do not have interfingering of albic material in the upper part of the argillic horizon. However, this difference does not affect the use and management of the soils.

Darien series

The Darien series consists of deep, somewhat poorly drained soils mainly on till plains and in some valleys. These soils formed in glacial till deposits derived principally from moderately soft shale. In some areas, these soils have a silty substratum. A few areas were once part of glacial lakes. Slope ranges from 0 to 15 percent but is dominantly 0 to 3 percent.

The Darien soils formed in the same kind of parent material as the associated moderately well drained Danley soils and the poorly drained Ilion soils. They are near the Honeoye, Langford, Remsen, and Rhinebeck soils. The Darien soils are not as well drained and have a higher clay content than the Honeoye soils, are more poorly drained and do not have the fragipan layer of the Langford soils, and have a lower clay content than the Remsen and Rhinebeck soils.

Typical pedon of Darien silt loam, 0 to 3 percent slopes, in the town of Orchard Park, near U.S. Highway 20 and three-quarters of a mile west of Transit Road:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many fine roots; 10 percent shale fragments; slightly acid; abrupt smooth boundary.

A2—10 to 13 inches; grayish brown (2.5Y 5/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; few bleached light gray (2.5Y 7/2) skeletans; weak fine and medium subangular blocky structure; friable; many fine roots; common fine pores; 10 percent shale fragments; slightly acid; clear irregular boundary.

B21t—13 to 22 inches; olive brown (2.5Y 4/4) silty clay loam; many medium distinct yellowish brown (10YR 5/4) and faint olive (5Y 4/4) mottles; moderate medium subangular blocky structure; friable; ped faces are dark grayish brown (2.5Y 4/2); few fine roots; common fine pores; grayish brown (2.5Y 5/2) clay films lining pores and discontinuous on many ped faces; grayish brown (2.5Y 5/2) silt coatings (A2-like material) on vertical ped faces in upper part of the horizon; 10 percent shale fragments; slightly acid; gradual wavy boundary.

B22t—22 to 34 inches; dark grayish brown (2.5Y 4/2) silty clay loam; many fine and medium distinct yellowish brown (10YR 5/6) and olive (5Y 5/4) mottles; weak coarse prismatic structure parting to moderate coarse and medium subangular blocky; firm; few pores; grayish brown (2.5Y 5/2) clay films in pores and continuous on most ped faces; 10 percent shale fragments; neutral; clear wavy boundary.

C—34 to 60 inches; dark grayish brown (2.5Y 4/2) shaly silty clay loam; few medium distinct light olive brown (2.5Y 5/4) mottles; weak medium and thick platy structure with dark gray (5Y 4/1) cleavage planes along plate faces; firm; 20 percent shale fragments; calcareous, moderately alkaline.

The thickness of solum ranges from 30 to 45 inches. Depth to carbonates ranges from 25 to 45 inches. Bedrock is at a depth of more than 5 feet and is mainly gray to black shale. Coarse fragments, mainly shale, range from 5 to 15 percent by volume of the A horizon, increase to as much as 35 percent in the lower part of the B horizon, and make up as much as 60 percent of the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2. It is dominantly silt loam but includes loam and silty clay loam. Reaction ranges from medium acid to neutral. The A2 horizon has value of 5 or 6 and chroma of 2 or 3. Texture is similar to that of the Ap horizon.

The B2t horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 2 through 4. The ped faces have coatings with chroma of 1 or 2. The average clay content of the upper 20 inches of the B horizon ranges from about 28 to 35 percent. It is clay loam, silt loam, silty clay loam or the shaly analogs of those textures. Reaction ranges from slighlty acid to neutral. There is a B3 horizon in some pedons.

The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 to 3. It is silt loam, clay loam, or silty clay loam or, in many places, the shaly or very shaly analogs of those textures. In some pedons the substratum below a depth of 40 inches is relatively free of coarse fragments and is dominated by silt loam or silty clay loam textures. The C horizon is massive or has platy structure. Reaction is mildly or moderately alkaline.

Derb series

The Derb series consists of deep, somewhat poorly drained soils on glacial till plains and glaciated dissected plateaus where shale bedrock is commonly within 10 feet of the surface. These soils formed in glacial till deposits derived from soft shale and siltstone bedrock. Slope ranges from 0 to 15 percent but is dominantly 3 to 8 percent.

The Derb soils are associated with the Hornell, Orpark, and Schuyler soils. The Derb soils are not as high in clay content as the Hornell soils, are deeper to shale bedrock than the Orpark soils, and are not as well drained as the Schuyler soils. The Derb soils are near the Churchville and Manlius soils but have a lower clay content than the Churchville soils and are deeper to bedrock than the Manlius soils and not as well drained.

Typical pedon of Derb silt loam, 3 to 8 percent slopes, in the town of Eden, 1,000 feet east of New York Highway 75 and 150 feet south of Hardt Road:

Ap—0 to 6 inch; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; fewer than 5 percent fine shale fragments; strongly acid; abrupt smooth boundary.

B21—6 to 14 inches; brown (10YR 5/3) silt loam; many (30 percent) medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular structure; friable; common roots; light brownish gray (2.5Y 6/2) ped faces; 5 percent fine shale fragments; strongly acid; clear wavy boundary.

B22—14 to 24 inches; brown (10YR 5/3) silty clay loam; many (30 percent) medium prominent strong brown (7.5YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; few roots; gray (5Y 5/2) ped faces; 5 percent weathered shale fragments; very strongly acid; clear wavy boundary.

B3—24 to 38 inches; olive (5Y 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate thin and medium platy; firm; few roots; light olive gray (5Y 6/2) ped faces; 5 percent shale fragments; very strongly acid; clear smooth boundary.

C—38 to 60 inches; olive (5Y 5/4) silt clay loam; common medium distinct light gray (2.5Y 7/1) and yellowish brown (10YR 5/8) mottles; weak medium platy structure; firm; 10 percent shale fragments; strongly acid.

The thickness of the solum ranges from 24 to 40 inches. Depth to shale bedrock ranges from 40 inches to 10 feet or more, but in many places soft shale bedrock is only a little more than 40 inches deep. Coarse fragments range from 0 to 10 percent in the A and B horizons and from 5 to 20 percent in the C horizon. Reaction ranges from very strongly acid to strongly acid, unless the soil is limed.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. It is silt loam or silty clay loam. Consistence is very friable or friable.

The B2 horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 2 through 4. Ped faces dominantly have chroma of 2 or less. The fine earth fraction is silt loam or silty clay loam. The B2 horizon has prismatic or blocky structure and friable or firm consistence. Where there is a B3 horizon, the color and texture are similar to the B2 horizon. Structure is prismatic or platy.

The C horizon has color similar to the B horizon except that the chroma is 2 or 1. It is silt loam, silty clay loam or the shaly analogs of those textures. The C horizon is massive or has weak or moderate platy structure.

Edwards series

The Edwards series consists of deep, very poorly drained organic soils on lake plains, outwash plains, and till plains. These soils formed in depressional areas. The organic material is underlain by marl. Slope ranges from 0 to 3 percent but is mostly less than 1 percent .

The Edwards soils formed in the same kind of organic material as the associated Palms muck but do not have the underlying loamy mineral deposits of the Palms soils. The Edwards soils are also associated with the Chenango, Blasdell, Lamson, and Canandaigua soils. They have less gravel and are not as well drained as the Chenango and Blasdell soils, are not as sandy as the Lamson soils, and have a lower silt and clay content than the Canandaigua soils. The Edwards soils have a higher organic matter content than the associated soils.

Typical pedon of Edwards muck, in the town of Concord, 50 yards south of Concord Road and 0.6 mile east of the Morton Corners Road:

Oa1—0 to 6 inches; dark reddish brown (5YR 2/2) muck (sapric material); moderate fine granular structure; very friable, slightly sticky; 35 percent fibers unrubbed, 10 percent rubbed; abundant fine roots; fibers dominantly herbaceous, few woody fragments; mineral content is 10 percent silt; slightly acid; gradual smooth boundary.

Oa2—6 to 24 inches; black (10YR 2/1) muck (sapric material); moderate medium granular structure; friable, slightly sticky; 35 percent fibers unrubbed, less than 10 percent rubbed; few fine roots in upper part; fibers are herbaceous; mineral content less than 10 percent; neutral; gradual wavy boundary.

Oa3—24 to 33 inches; black (10YR 2/1) muck (sapric material); weak coarse granular structure; friable, slightly sticky; 30 percent fibers unrubbbed, less than 10 percent rubbed; fibers are herbaceous; mineral content about 15 percent silt; mildly alkaline; clear smooth boundary.

Lca—33 to 50 inches; white (10YR 8/1) marl that contains numerous small shell fragments; massive; friable, sticky; strong effervescence; moderately alkaline.

The organic deposits are 16 to 49 inches thick over marl. The fibers in the organic material are primarily derived from herbaceous plants. Thin layers of hemic material in the subsurface and bottom tiers of some pedons combined have a thickness of less than 10 inches. Thin layers of fibric materials are also in a few pedons. The organic soil material in some pedons is up to 20 percent by volume coarse woody fragments, consisting of twigs, branches, or logs. In a few pedons, a single log occupies the major part of a layer. Bedrock is at a depth of more than 5 feet. Snail shells commonly are in the organic layers immediately above the marl and are mixed throughout some pedons.

The surface layer is neutral or has hue of 10YR to 5YR, value of 2, and chroma of 0 to 2 on broken faces and when rubbed. Rubbed fiber percentages are typically less than 10 percent. Structure is weak or moderate, fine or medium granular or weak, thick platy. Reaction ranges from medium acid to mildly alkaline.

The organic subsurface layers are neutral or have hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 through 3 on broken faces and when rubbed. Structure is weak platy, granular, or blocky or the material is massive. Reaction ranges from medium acid to mildly alkaline. In some profiles, the lower part of the organic material contains free carbonates.

The Lca horizon has hue of 10YR, value of 5 through 8, and chroma of 1 or 2. Reaction is mildly or moderately alkaline. In some pedons, the marl has layers of sandy material that total less than 12 inches in thickness.

Elnora series

The Elnora series consists of deep, moderately well drained soils on remnant sandbars or beaches in the lowland lake plain. These soils formed in lacustrine or windblown deposits of fine sand. Slope ranges from 0 to 8 percent.

The Elnora soils formed in the same kind of parent material as the better drained Colonie soils. They are associated with the Arkport, Galen, and Minoa soils. The Elnora soils do not have the clay banding that is in the subsoil of the well drained Arkport soils and the moderately well drained Galen soils. They are better drained than the somewhat poorly drained Minoa soils.

Typical pedon of Elnora loamy fine sand, 3 to 8 percent slopes, in the town of Amherst, 1.5 miles northwest of junction of Klein and Transit Roads:

Ap—0 to 4 inches; very dark grayish brown (10YR 3/2) loamy fine sand; weak fine and very fine granular structure; very friable; common fine and medium roots; very strongly acid; abrupt smooth boundary.

B21—4 to 10 inches; strong brown (7.5YR 5/8) loamy fine sand; weak very fine granular structure; very friable; few fine and medium roots; many pores; very strongly acid; clear wavy boundary.

B22—10 to 17 inches; yellowish brown (10YR 5/6) loamy fine sand; weak fine granular structure; very friable; few medium roots; common pores; strongly acid; clear wavy boundary.

B23—17 to 24 inches; yellowish brown (10YR 5/4) loamy fine sand; few medium faint dark yellowish brown (10YR 4/4) mottles; very weak fine subangular blocky structure; friable; few fine pores; strongly acid; clear wavy boundary.

C1—24 to 42 inches; pale brown (10YR 6/3) fine sand; common medium and coarse faint strong brown (7.5YR 7/2) and few medium faint light gray (10YR 7/2) mottles; structureless, single grain; very friable; few fine pores; medium acid; gradual boundary.

C2—42 to 60 inches; grayish brown (10YR 5/2) fine sand; common medium distinct strong brown (7.5YR 5/6) mottles; structureless, single grain; loose; slightly acid.

Depth to texturally constrasting material or bedrock is more than 6 feet. There are commonly no coarse fragments, but some pedons have subhorizons as much as 12 inches thick that contain up to 15 percent pebbles.

The Ap or A1 horizons have hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 or 3. Texture is dominantly loamy fine sand but ranges to very fine sandy loam in some pedons. Reaction ranges from very strongly acid to slightly acid.

The B horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 3 through 8. Texture is loamy fine sand or fine sand. Structure is very weak to weak granular, subangular blocky, or platy. Consistence is very friable or friable. Reaction ranges from strongly acid to slightly acid. There is no B horizon in some pedons.

The C horizon has hue of 7.5YR through 2.5Y, value of 3 through 6, and chroma of 1 through 4. Texture is loamy fine sand or fine sand. The C horizon is massive or single grain or it has weak platy structure. Reaction ranges from strongly acid to neutral.

Erie series

The Erie series consists of deep, somewhat poorly drained soils on till plains on the upland plateau. These soils formed in glacial till derived mainly from siltstone or sandstone and from shale and limestone. There is a dense fragipan layer in the lower part of the subsoil. Slope ranges from 0 to 15 percent but is dominantly 0 to 8 percent.

The Erie soils formed in the same kind of parent material as the associated well drained and moderately well drained Langford soils and the poorly drained Chippewa soils. Other nearby soils are the Mardin and Volusia soils. The Erie soils are not as well drained as the Mardin soils and have a coarser textured subsoil than the similar Volusia soils.

Typical pedon of Erie channery silt loam, 3 to 8 percent slopes, in the town of Collins, near Woodside Road and 1,500 feet east of New Oregon Road:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) channery silt loam; moderate medium granular structure; very friable; many fine roots; 15 percent coarse fragments; slightly acid, abrupt smooth boundary.

B2—9 to 14 inches; pale brown (10YR 6/3) channery silt loam; many fine and medium distinct yellowish brown (10YR 5/6) and brown (7.5YR 5/4) mottles; weak fine subangular blocky structure; friable; many fine roots; common fine pores; 1 percent coarse fragments; slightly acid; clear wavy boundary.

Bx1—14 to 25 inches; dark grayish brown (2.5Y 4/2) channery silt loam; strong brown (7.5YR 5/6) mottles on border of light brownish gray (10YR 6/2) silty streaks 1/2 inch to 1-1/2 inches wide enclose prisms 9 to 15 inches in diameter; common medium distinct yellowish brown (10YR 5/4) mottles in interior of prisms; strong very coarse prismatic structure parting to moderate medium subangular blocky; very firm and brittle; few roots along prism faces; common fine pores; common grayish brown (10YR 5/2) clay films lining pores in prism interiors and patch clay films on prism faces; 20 percent coarse fragments; slightly acid; gradual wavy boundary.

Bx2—25 to 40 inches; dark grayish brown (2.5Y 4/2) channery silt loam that has prism faces 12 to 22 inches in diameter; few medium distinct yellowish brown (10YR 5/6) mottles; strong very coarse prismatic structure parting to moderate medium subangular blocky in the upper part, grading to medium and thick platy in the lower part; very firm and brittle; few fine pores; grayish brown (2.5Y 5/2) clay films lining pores in prism interiors; 20 percent coarse fragments; neutral; clear wavy boundary.

C—40 to 60 inches; dark grayish brown (2.5Y 4/2) channery silt loam; common fine and medium faint olive brown (2.5Y 4/4) mottles; weak thick platy structure; very firm; few fine pores; 25 percent coarse fragments; weakly calcareous; mildly alkaline.

The thickness of the solum ranges from 36 to 70 inches, and depth to carbonates ranges from 40 to 60 inches. Depth to the top of the fragipan ranges from 10 to 24 inches. Bedrock is at a depth of more than 5 feet. Coarse fragments range from 15 to 35 percent in the horizons above the fragipan and from 20 to 60 percent in the Bx and C horizons.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. Texture is channery silt loam, channery loam, or channery fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The B2 horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 2 through 4. Mottles range from common to many and have a lighter chroma than the matrix. Texture is fine sandy loam, loam, silt loam, or their channery analogs. Consistence is friable or firm. Reaction ranges from strongly acid to slightly acid. The Bx horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 or 3. It is loam, silt loam, or silty clay loam, or channery or very channery analogs of those textures. Structure is weak to strong, very coarse prismatic, weak or moderate, medium and coarse blocky, or medium and thick platy. Consistence is firm or very firm. Reaction ranges from strongly acid to mildly alkaline.

The C horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 2 or 3. Texture is similar to the Bx horizon. Structure is platy, or the material is massive. Consistence is firm or very firm. Reaction ranges from medium acid to moderately alkaline.

Farmington series

The Farmington series consists of loamy, shallow, well drained soils at the edge of the upland plateau near the limestone escarpment where bedrock is at a depth of 10 to 20 inches. These soils formed in thin deposits of glacial till overlying hard limestone bedrock. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Farmington soils are closely associated with the Benson, Wassaic, and Newstead soils. The Farmington soils have a lower coarse fragment content than the Benson soils, are shallower to bedrock than the Wassaic soils, and are better drained than the somewhat poorly drained Newstead soils. They are also associated with the Honeoye, Lima, and Cazenovia soils on adjacent landforms, but the Farmington soils are shallower to limestone bedrock and have less clay in the subsoil than these soils.

Typical pedon of Farmington cherty loam, 0 to 3 percent slopes, in the town of Newstead, near Indian Falls Road and 1 mile southeast of the village of Akron:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) cherty loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; very friable; many fine roots; 20 percent coarse fragments; slightly acid; abrupt smooth boundary.

B2—9 to 16 inches; brown (10YR 4/3) cherty loam; weak fine subangular blocky structure; friable; common fine roots; many fine and medium pores; 20 percent coarse fragments; neutral; abrupt smooth boundary.

R—16 inches; grayish limestone bedrock; fractured, with material from above sifting into cracks in the rock.

The thickness of the solum and depth to bedrock range from 10 to 20 inches. The fine earth fraction of the solum contains 10 to 27 percent clay. Coarse fragments range from 15 to 35 percent by volume in the A horizon and from 5 to 35 percent in the B horizon.

The Ap horizon has value of 3 to 5 when moist and value of 6 when dry. Texture is cherty loam or cherty silt loam. Reaction ranges from strongly acid to slightly acid.

The B horizon has value of 4 or 5 and chroma of 3 or 4. It ranges from fine sandy loam to silt loam or the cherty or gravelly analogs of those textures. Structure ranges from fine or medium subangular blocky to very weak granular. Consistence is very friable or friable. Reaction ranges from medium acid to mildly alkaline.

Farnham series

The Farnham series consists of deep, moderately well drained soils on alluvial fans, stream terraces, outwash plains, glacial lake beaches, and recessional moraines. These soils formed in water-sorted deposits dominated by partially rounded shale fragments. Slope ranges from 0 to 8 percent but is dominantly 3 to 8 percent.

The Farnham soil formed in the same kind of parent material as the associated better drained Blasdell soils. They are also associated with the Scio and Allard soils on lower terraces, the Middlebury and Tioga soils on flood plains, and the Marilla and Manlius soils near glacial till uplands. The Farnham soils have a higher shale fragment content than the Scio, Allard, Middlebury, and Tioga soils, but do not have the fragipan that is in the Marilla soils, and are deeper to bedrock than the Manlius soils.

Typical pedon of Farnham shaly silt loam, 0 to 3 percent slopes, in the town of Hamburg, 0.7 mile east-northeast of intersection of U.S. Highway 20 and Lakeview Road and 100 feet west of landfill site:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) shaly silt loam; moderate fine granular structure; very friable; many fine roots; 25 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21—7 to 14 inches; dark brown (7.5YR 4/4) shaly silt loam; weak fine subangular blocky structure; very friable; many fine roots; 35 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—14 to 21 inches; dark brown (10YR 4/3) very shaly loam; weak fine subangular blocky structure; very friable; many fine roots; 50 percent coarse fragments; strongly acid; diffuse wavy boundary.

B23—21 to 38 inches; dark brown (10YR 4/3) very shaly loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; very friable; 55 percent coarse fragments; strongly acid; diffuse wavy boundary.

C—38 to 60 inches; grayish brown (10YR 5/2) very shaly loam; common medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; 60 percent coarse fragments; strongly acid at 40 inches, slightly acid at 60 inches.

The thickness of the solum ranges from 24 to 48 inches. Depth to bedrock is more than 60 inches. Coarse fragments are dominantly shale and range from 15 to 35 percent by volume in the A horizon, from 15 to 60 percent in the B horizon, and from 45 to 70 percent in the C horizon. Texture of the fine earth fraction throughout the soil ranges from loam to silt loam.

The Ap horizon has hue of 10YR or 2.5Y and value of 3 or 4. Structure ranges from weak or moderate fine granular to weak or moderate medium subangular blocky. Consistence is friable or very friable. Reaction ranges from very strongly acid through medium acid, unless the soil is limed.

The B horizon has hue of 7.5YR through 5Y, value of 4 or 5, and chroma of 3 through 6. There are mottles in the lower part of the B horizon. Structure ranges from weak through moderate, fine or medium subangular blocky. Consistence is very friable through firm. Reaction ranges from very strongly acid through medium acid.

The C horizon has hue of 10YR through 5Y, value of 3 to 5, and chroma of 2 to 4. Consistence is friable or firm. Reaction ranges from strongly acid to slightly acid at a depth of 80 inches or less.

Fluvaquents

The Fluvaquents consist of moderately deep and deep, somewhat poorly drained soils that formed in recent alluvial deposits. These soils have little or no soil profile development. They are adjacent to streams that are subject to frequent flooding. Slope ranges from 0 to 3 percent but is mostly less than 2 percent.

Fluvaquents occur in undifferentiated group with Udifluvents. They often are near the Hamlin, Tioga, Middlebury, Teel, and Wayland soils. Fluvaquents are in that part of the flood plain where the adjacent stream, through scour, cutting, and lateral erosion, commonly shifts the soil deposits from place to place.

Because of the variability of Fluvaquents, a typical pedon is not provided. The solum of these soils consists of a surface layer 1 to 10 inches thick. Depth to bedrock is usually 1-1/2 to 20 feet or more. Coarse fragments, including gravel, shale, cobblestones, and flagstones, range from 0 to 60 percent by volume. These soils are very strongly acid to mildly alkaline. Organic matter content decreases irregularly with depth.

The surface layer has hue of 5YR to 2.5Y, value of 2 to 5, and chroma of 0 or 2. It is quite variable, ranging from sandy loam to silty clay loam or the shaly, gravelly, cobbly, or very gravelly analogs of those textures.

The substratum has hue of 5YR to 2.5Y, value of 3 to 6, and chroma of 0 to 5. Mottles commonly occur.

Texture ranges from sand to silty clay loam or their gravelly, flaggy, cobbly, or very gravelly analogs. Consistence is friable or loose.

Galen series

The Galen series consists of deep, moderately well drained soils on the lowland lake plain. They are mostly in the northern and western parts of the county. A few areas are in the southern part. These soils formed in sandy deposits on deltas and beaches of former glacial lakes. In some places these soils have a glacial till substratum. Slope ranges from 0 to 8 percent.

The Galen soils formed in the same kind of parent material as the well drained Arkport soils and the somewhat poorly drained Minoa soils. They are associated with the Elnora, Claverack, and Williamson soils and, where they have a glacial till substratum, are often associated with the Honeoye and Lima soils. The Galen soils are not quite as sandy as the Elnora soils, do not have the clayey substratum of the Claverack soils, are not as silty as the Williamson soils that have a fragipan, and have a lower clay and rock fragment content than the Honeoye and Lima soils.

Typical pedon of Galen very fine sandy loam, 0 to 3 percent slopes, in the town of Newstead, 300 feet west of New York Highway 94 and 0.3 mile north of the intersection of Brucker Road and New York Highway 93:

Ap—0 to 8 inches; dark brown (10YR 3/3) very fine sandy loam; moderate fine granular structure; very friable, nonsticky; common very fine roots; strongly acid; abrupt smooth boundary.

B21—8 to 13 inches; brownish yellow (10YR 6/6) fine sandy loam; common fine distinct strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure parting to fine granular; very friable, nonsticky, compact in place; few very fine roots; medium acid; clear wavy boundary.

B22—13 to 24 inches; brown (10YR 5/3) loamy fine sand; few fine prominent strong brown (7.5YR 5/8) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure parting to weak fine granular; very friable, nonsticky, compact in place; medium acid; clear irregular boundary.

A'2&B23t—24 to 36 inches; brown (10YR 5/3) loamy fine sand; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable, nonsticky; dark yellowish brown (10YR 4/4) fine sandy loam lamellae 1/8 to 3/4 inch thick aggregating to 7 inches; leached root and worm channels, 1 to 2 millimeters in diameter, filled with light gray (10YR 7/2) loamy fine sand; distinct clay bridging in B part of horizon, medium acid; gradual wavy boundary.

C—36 to 60 inches; pale brown (10YR 6/3) fine sand; common medium faint yellowish brown (10YR 5/6) and common medium faint light brownish gray (10YR 6/2) mottles; single grain; loose; thin strata of very fine sand; slightly acid.

The thickness of the solum ranges from 36 to 60 inches. Depth to carbonates is 48 to 84 inches in most pedons. Depth to bedrock is more than 5 feet. There are usually no coarse fragments, but some pedons contain up to 3 percent by volume of fine gravel.

The Ap horizon ranges from 10YR through 7.5YR in hue, from 3 through 5 in value, and is 2 or 3 in chroma. It is mainly very fine sandy loam, but in some pedons it is fine sandy loam or loamy very fine sand. This horizon is friable or very friable, and it ranges in natural reaction from strongly acid to neutral.

The B2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 through 6. Texture ranges from fine sand through very fine sandy loam. It has weak granular or subangular blocky structure. There is no B2 horizon in some pedons.

There is an A2 or A'2 horizon in some pedons. The A'2 or A2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4, with mottles having chroma higher than 2. It ranges from fine sand or loamy very fine sand to fine sandy loam. It is massive or has weak or moderate granular or subangular blocky structure. Consistence is friable or very friable, and reaction is medium acid to neutral.

The A&B horizon ranges from weak, coarse, subangular blocky structure to structureless, massive. It has lamellae, aggregating 6 to 15 inches in thickness, within more sandy and lighter colored material. The lamellae have hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 3 or 4. The lamellae range from loamy fine sand to very fine sandy loam and are firm or friable. Interlamellae parts have colors similar to those of the A2 horizon. The interlamellae parts are loamy fine sand, loamy very fine sand, and fine sand. They are very friable or loose and are medium acid to neutral.

The C horizon is mainly stratified fine sand and very fine sand but includes thin silty layers in some pedons. It ranges from medium acid to mildly alkaline. In some areas, the A&B horizon rests on a IIC horizon consisting of loamy glacial till.

Getzville series

The Getzville series consists of deep, poorly drained on low glacial lake plains in the northern part of the county. These soils formed in glacial lake-laid sediments and old alluvial deposits. Slope ranges from 0 to 3 percent.

The Getzville soils formed in the same kind of parent material as the associated somewhat poorly drained Swormville soils. They are also associated with the

Elnora, Minoa, Raynham, Niagara, and Lamson soils. Getzville soils are not as well drained as the Elnora and Minoa soils and do not have the deep, sandy deposits. They have a higher clay content in the subsoil than the Raynham soils and have more sand in the substratum than the better drained Niagara soils. The Getzville soils do not have the sand content in the subsoil that the Lamson soils have.

Typical pedon of Getzville silt loam, in the town of Amherst, 0.3 mile south of Tonawanda Creek Road and 300 feet west of New Road:

Ap—0 to 8 inches; dark grayish brown (2.5Y 4/2) heavy silt loam; moderate medium subangular blocky structure; friable; common fine and very fine roots; medium acid; abrupt smooth boundary.

B2—8 to 19 inches; light brownish gray (2.5Y 6/2) light silty clay loam; common fine distinct yellowish brown (10YR 5/6) and common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky; firm, slightly sticky and plastic; few very fine roots; thin continuous grayish brown (2.5Y 5/2) silt coatings on ped faces; thin patchy clay films in pores; neutral; gradual wavy boundary.

B3—19 to 24 inches; light brownish gray (2.5Y 6/2) silt loam; many medium distinct dark yellowish brown (10YR 4/6) and many fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable, nonsticky and slightly plastic; few very fine roots; weakly effervescent; neutral; clear wavy boundary.

IIC—24 to 60 inches; dark brown (10YR 4/3) fine sand; few coarse distinct strong brown (7.5YR 5/6) mottles; massive; very friable; thin firm reddish brown (5YR 5/3) silt loam strata in lower part; strongly effervescent; moderately alkaline.

Depth to the underlying sandy material ranges from 15 to 36 inches. The thickness of the solum ranges from 20 to 40 inches. Gravel-size coarse fragments range from 0 to 5 percent in the A and B horizons and from 0 to 40 percent in the C horizon.

The Ap and A1 horizons have hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 1 through 3. They are silt loam or silty clay loam. They have weak or moderate, fine or medium granular or subangular blocky structure. Consistence is friable to firm. Reaction ranges from strongly acid to neutral.

The B2 horizon has hue of 7.5 through 5Y, value of 3 through 6, and chroma of 2 or less. Mottles with chroma of more than 2 make up more than 40 percent of the matrix in the B horizon above a depth of 30 inches. Texture ranges from silt loam to light silty clay loam. Clay content averages between 18 and 35 percent. Structure is weak or moderate, medium or coarse prismatic or moderate or strong, medium or coarse subangular blocky or blocky. Consistence is firm or very firm. Reaction ranges from medium acid to neutral. The B3 horizon has colors and mottles similar to those of the B2 horizon, but the structure is generally weaker. Texture ranges from silt loam to light silty clay loam. Consistence ranges from friable to loose. A thin IIB3 horizon with loamy fine sand to clay loam texture is in some pedons and replaces the B3 horizon. Reaction ranges from medium acid to netural.

The IIC horizon has hue of 5YR through 5Y, value of 3 through 5, and chroma of 1 through 4. Texture of the fine earth fraction ranges from sand to loamy fine sand and is commonly stratified with thin layers of silt loam or very fine sandy loam. In most pedons, the IIC horizon contains free carbonates. Reaction ranges from neutral to moderately alkaline.

Halsey series

The Halsey series consists of deep, very poorly drained soils in depressions and along seepage areas of glacial outwash plains and valley terraces. These soils formed in glacial outwash deposits containing a sizable component of shale and sandstone gravel. Slope ranges from 0 to 3 percent.

The Halsey soils are in a drainage sequence with the somewhat poorly drained Red Hook soils. They are associated with the Chenango, Castile, Farnham, Blasdell, and Wayland soils. The Halsey soils are wetter and have a lower coarse fragment content than the Chenango and Castile soils. They are wetter than the Farnham and Blasdell soils and do not have the high shale content. They do not have the high silt content of the Wayland soils.

Typical pedon of Halsey silt loam, in the town of Concord, 0.5 mile east of New York Highway 240 and Foot Road intersection, east of main enterance to Sprague Brook Park and north of Foot Road:

A1—0 to 8 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; very friable, slightly sticky; many fine roots; 5 percent coarse fragments; slightly acid, clear wavy boundary.

IIB2g—8 to 20 inches; grayish brown (2.5Y 5/2) gravelly silt loam; common medium distinct gray (5Y 5/1) and light olive brown (2.5Y 5/4) mottles; weak medium and coarse subangular blocky structure; friable, non sticky; few fine roots; 20 percent coarse fragments; medium acid, clear smooth boundary.

IIIB3g—20 to 25 inches; gray (10YR 5/1) very gravelly sandy loam; common medium distinct light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; friable; 35 percent coarse fragments; slightly acid; abrupt wavy boundary.

IIIC—25 to 50 inches; gray (10YR 5/1) stratified gravel and sand; single grain; loose, nonsticky; 60 percent coarse fragments, neutral.

The solum is 20 to 34 inches thick and depth to carbonates ranges from 36 to 60 inches. Depth to bedrock is more than 5 feet. The volume of coarse fragments ranges from 5 to 35 percent in the A horizon and the B horizon and from 10 to 60 percent in the C horizon.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 0, 1, or 2. Texture of the fine earth portion is mainly silt loam but includes loam or sandy loam. Structure is weak or moderate fine granular or very weak fine subangular blocky. Reaction ranges from medium acid to neutral. There is an A2 horizon in some pedons.

The B horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 1 or 2 and has medium or coarse, distinct or prominent mottles. It is loam, silt loam, or fine sandy loam or the gravelly analogs of those textures. The B3 horizon commonly ranges to sandy loam in the fine earth portion. Structure is moderate or weak, medium platy or weak subangular blocky, and consistence is friable or firm. Reaction is medium acid to neutral.

The C horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 0 to 2 and has distinct mottles in some pedons. This horizon consists of stratified gravel and sand or stratified sandy loam. Consistence is loose to firm. Reaction is slightly acid to moderately alkaline.

Hamlin series

The Hamlin series consists of deep, well drained soils on the highest parts of flood plains in valleys and on the lowland lake plain. These soils formed in silty alluvial deposits. Slope ranges from 0 to 3 percent.

The Hamlin soils are associated with the Teel, Tioga, and Wayland soils. The Hamlin soils are better drained than the moderately well drained to somewhat poorly drained Teel soil. They do not have the sand and gravel content of the Tioga soils. They are adjacent on flood plains to the poorly drained and very poorly drained Wayland soils.

Typical pedon of Hamlin silt loam, in the town of West Seneca, 1.3 miles north of Gardenville on west side of New York Highway 277 behind trailer park, 200 feet west of town boundary:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21—8 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; common fine roots; many fine pores; slightly acid; gradual smooth boundary.

B22—10 to 42 inches; brown (10YR 4/3) silt loam; weak coarse prismatic structure; friable; few roots; many pores; neutral; gradual smooth boundary.

C—42 to 65 inches; dark grayish brown (10YR 4/2) silt loam; massive; friable; neutral.

The thickness of the solum ranges from 24 to 48 inches. Depth to carbonates and to strongly contrasting material is more than 40 inches. Depth to bedrock is more than 5 feet. Coarse fragments range from 0 to 5 percent by volume at a depth of less than 40 inches and from 0 to 15 percent below 40 inches.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 to 3. Dry value is 6 to 7. Texture is silt loam or very fine sandy loam. Consistence is very friable or friable. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. It is sometimes mottled below a depth of 24 inches. Texture is silt loam or very fine sandy loam. Structure is weak or moderate granular, subangular blocky, or prismatic. Reaction ranges from strongly acid to neutral.

The C horizon has hue of 7.5YR to 10YR, value of 3 to 5, and chroma of 2 to 4. It ranges from silt loam to fine sandy loam. The C horizon is massive or has weak platy structure as a result of fine stratification. Reaction is medium acid to neutral at a depth of less than 40 inches and ranges to mildly alkaline below 40 inches.

Haplaquolls

The Haplaquolls are deep, very poorly drained mineral soils that have a dark surface layer rich in organic matter. These soils are ponded with shallow water during much of the year and are commonly called freshwater marshes. Haplaquolls formed in lacustrine, outwash, glacial till, or alluvial deposits. These level soils are in low areas or depressions, commonly adjacent to natural or manmade lakes, ponds, and other bodies of open water. Slope ranges from 0 to 1 percent.

In some areas, Haplaquolls are adjacent to the Edwards and Palms muck that formed in moderately deep deposits of organic material over marl and loamy mineral deposits. They are commonly near slightly higher areas of Lyons, Canandaigua, Wayland, Lamson, and Halsey soils where ponding may occur for brief periods early in the spring.

Because of the variability of Haplaquolls, a typical pedon is not provided.

Haplaquolls have a solum that ranges from 5 to more than 25 inches thick, and bedrock is at a depth of more than 5 feet. Coarse fragments range from 0 to 50 percent by volume. These soils are medium acid to neutral in the solum and commonly grade to mildly alkaline in the lower part of the substratum.

The surface layer, in some places, is well decomposed or moderately well decomposed organic deposits mixed with some mineral soil material. Color ranges in hue from 10YR to 5Y, has value of 2 or 3, and has chroma of 0 to 2. This organic layer is 1 to 16 inches thick.

In other areas the surface layer is mineral material 1 to 25 inches thick. It has hue of 10YR to 5Y, value of 2 to 4, and chroma of 10R 2. Texture ranges from mucky silt loam to loamy sand or their gravelly analogs.

In some places, the surface layer consists of both organic and mineral soil material.

The subsoil and substratum are neutral in color or have hue of 10YR to 5Y, value of 3 to 6, and chroma of 0 to 3. Mottles are commonly present. Texture ranges from silty clay loam to loamy sand or their gravelly or very gravelly analogs. The subsoil is 1 to 10 inches thick or some pedons have none.

Honeoye series

The Honeoye series consists of deep, well drained soils on convex knolls, hills, and ridges on till plains. These soils formed in glacial till deposits derived mostly from limestone and alkaline shale. Slope ranges from 0 to 8 percent but is dominantly 3 to 8 percent.

The Honeoye soils formed in the same kind of parent material as the associated Lima and Appleton soils but are better drained than these soils. The Honeoye soils are near the Cazenovia and Ovid soils but have less clay in the subsoil than either of these soils.

Typical pedon of Honeoye loam, 3 to 8 percent slopes, in the town of Newstead, 2 miles east of the village of Clarence, near Haven Road, about 500 feet south of New York Highway 5:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam; moderate fine and medium granular structure; friable; many fine roots; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2—10 to 12 inches; light brownish gray (10YR 6/2) loam; weak medium platy structure; friable; many fine roots; many fine pores; 10 percent coarse fragments; common skeletans; slightly acid; abrupt irregular boundary.

B&A—12 to 14 inches; brown (7.5YR 4/4) loam with fingers of light brownish gray (10YR 6/2) A2 material along vertical ped faces and surrounding some peds, decreasing in thickness with depth; moderate fine and medium subangular blocky structure; firm; common fine roots; common fine pores, pores in ped interiors have clay films; 10 percent coarse fragments; neutral; gradual wavy boundary.

B2t—14 to 25 inches; reddish brown (5YR 4/4) loam; moderate medium subangular blocky structure; firm; common fine roots; common fine pores; dark reddish gray (5YR 4/2) clay films on ped faces and lining all pores; 10 percent coarse fragments; neutral; clear wavy boundary.

C—25 to 60 inches; brown (7.5YR 5/2) gravelly loam; moderate medium and thick platy structure; firm; few roots; few pores; streaks of pinkish gray (7.5YR 7/2) lime segregated on plate faces; 20 percent coarse fragments; calcareous, moderately alkaline.

The thickness of the solum ranges from 16 to 32 inches and corresponds to depth to carbonates. Depth to bedrock is more than 5 feet. Coarse fragments range from 5 to 15 percent in the A horizon, 5 to 30 percent in the B horizon, and 20 to 65 percent in the C horizon.

The Ap horizon ranges in hue from 7.5YR through 10YR and in value from 3 through 5. Color value is 6 or more when the soil is dry. Texture ranges from silt loam to fine sandy loam, but loam textures are dominant. Consistence is friable or very friable. Reaction is medium acid or slightly acid. The A2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 thorugh 4. It is silt loam or loam or the gravelly analogs of those textures. There may not be an A2 horizon in some pedons where the soil is deeply plowed. Reaction ranges from medium acid to neutral.

The B&A horizon has A2-like material as coatings 1 to 2 millimeters thick on vertical faces of B-like peds. It is silt loam to clay loam or the gravelly analogs of those textures.

The Bt horizon ranges from 10YR to 5YR in hue, 4 to 5 in value, and 3 to 4 in chroma. It is loam, silt loam, or clay loam, averaging between 18 to 28 percent clay, and can contain gravelly analogs of those textures. It has weak to moderate, fine to coarse subangular blocky structure. Consistence is friable or firm. Reaction ranges from medium acid to mildly alkaline.

The C horizon has hue of 10YR to 5YR and value of 4 or 5. It is fine sandy loam, loam, or silt loam and gravelly, very gravelly, or cobbly analogs of those textures. Consistence is firm or very firm, and structure is medium to very thick platy. Reaction is mildly alkaline or moderately alkaline.

Hornell series

The Hornell series consists of moderately deep, somewhat poorly drained soils on bedrock-controlled till plains in the upland plateau. These soils formed in acid, clayey, glacial till derived from soft shale bedrock. Slope ranges from 0 to 15 percent but is dominantly 3 to 8 percent.

The Hornell soils are similar to the associated Orpark soils but have more clay in the subsoil. They are also associated with the Chippewa, Erie, Volusia, and Schuyler soils. The Hornell soils are better drained than the Chippewa soils, do not have the fragipan and are finer textured than the Erie and Volusia soils, and are not as well drained as the Schuyler soils.

Typical pedon of Hornell silt loam, 3 to 8 percent slopes, in the town of Orchard Park, at the edge of

Chestnut Ridge Park near Newton Road and 0.5 mile west of New York Highway 277:

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

B21—7 to 9 inches; yellowish brown (10YR 5/4) silty clay loam; few fine and medium distinct brownish gray (2.5Y 6/2) and faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; many fine roots; common fine pores; 5 percent coarse shale fragments; medium acid; clear wavy boundary.

B22g—9 to 19 inches; light brownish gray (2.5Y 6/2) silty clay loam, yellowish brown (10YR 5/4) crushed and smoothed; many (40 percent) medium prominent strong brown (7.5YR 5/6) and common medium distinct gray (10YR 5/1) mottles; moderate medium and coarse prismatic structure parting to strong medium angular blocky; firm, sticky; few fine roots; few fine pores, 5 percent coarse shale fragments; very strongly acid; clear wavy boundary.

B23g—19 to 29 inches; gray (2.5Y 5/1) silty clay; many (45 percent) medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure parting to weak medium platy; firm, sticky; few fine roots; very few pores; few clay films; olive gray (5Y 5/2) silt coatings on vertical prism faces; 5 percent coarse fragments; many soft shale fragments near lower boundary of this horizon; very strongly acid; gradual smooth boundary.

IICr—29 to 40 inches; olive gray (5Y 4/2) shaly silty clay (decomposed soft shale bedrock); strong thin and medium platy structure inherited from the bedrock; very firm; common prominent yellowish brown (10YR 5/6) stains; 30 percent coarse fragments; very strongly acid.

IIR—40 inches; olive gray (5Y 4/2) interbedded soft and hard shale bedrock.

The thickness of the solum and depth to soft weathered shale bedrock range from 20 to 40 inches. Interbedded soft and hard unweathered shale bedrock is at a depth of 40 to 60 inches. Coarse fragments range from 0 to 5 percent by volume in the A horizon, from 5 to 35 percent in the B horizon, and from 15 to 60 percent in the C horizon.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 1 through 4. Texture is silt loam on silty clay loam. Structure is granular or subangular blocky, and consistence ranges from very friable to firm. Reaction is extremely acid to strongly acid, unless the soil is limed.

The B2 horizon has hue of 10YR to 5Y, value of 3 through 6, and chroma of 1 through 8. Ped faces dominantly have chroma of 2 or less. This horizon is silty clay loam, silty clay, or clay or the shaly analogs of those textures. Consistence is firm or very firm. Reaction is very strongly acid or strongly acid.

The Cr horizon differs from the B horizon in that chroma ranges to 0, and it is more shaly. The material is massive or has platy structure inherited from the rock structure. Reaction is very strongly acid or strongly acid.

The bedrock, or R horizon, is dominantly shale and can be easily cut with a spade in the upper part.

Hudson series

The Hudson series consists of deep, moderately well drained soils on lake plains and side slopes of dissected ridges and on valley sides. These soils formed in glacial lake sediments having a high content of clay and silt. Slope ranges from 3 to 40 percent but is dominantly 25 to 40 percent.

The Hudson soils formed in the same kind of parent material as the associated Rhinebeck soils but are better drained. The Hudson soils are similar to the Odessa and Schoharie soils but are not as red as those soils and are better drained than the Odessa soils. They are also associated with the Collamer, Varysburg, and Cayuga soils. The Hudson soils have more clay in the subsoil than the Collamer soils, do not have the high gravel content of the Varysburg soils, and do not have the underlying loamy substratum of the Cayuga soils.

Typical pedon of Hudson silt loam, 8 to 15 percent slopes, in the town of Lancaster, one mile southwest of the village of Townline:

Ap—0 to 8 inches; brown (10YR 5/3) silt loam; strong medium and coarse granular structure; friable; slightly acid; clear smooth boundary.

A2—8 to 14 inches; pale brown (10YR 6/3) silt loam with grayish brown (10YR 5/2) ped interiors; many threadlike pale brown (10YR 6/3) mottles; weak medium subangular blocky structure parting to very weak thin platy; friable; slightly acid; clear wavy boundary.

B&A—14 to 23 inches; dark grayish brown (10YR 4/2) silty clay; strong medium and coarse subangular blocky structure; firm, very plastic; pale brown (10YR 6/3) silt coatings on ped faces of the upper 4 inches and thin brown (10YR 5/3) clay films on ped faces in the lower 5 inches; neutral; gradual wavy boundary.

B21t—23 to 29 inches; dark grayish brown (10YR 4/2) silty clay, few fine faint yellowish brown (10YR 5/4) mottles; moderate coarse and very coarse prismatic structure parting to strong coarse blocky; firm, very plastic; peds have thick brown (10YR 5/3) clay films; neutral; gradual wavy boundary.

C—29 to 60 inches; dark grayish brown (10YR 4/2) varved clay, few lenses of fine silt; firm; calcareous, moderately alkaline.

The thickness of the solum ranges from 24 to 40 inches, and depth to carbonates is 24 to 50 inches. Coarse fragments range from 0 to 25 percent in the A horizon and from 0 to 10 percent in the B and C horizons. Bedrock is at a depth of more than 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It ranges from loam to silty clay loam. In some areas the surface is gravelly. There is no A2 horizon in some places. Where the A2 horizon occurs, hue is 10YR or 2.5Y, value is 5 or 6, and chroma is 2 or 3. Texture is similar to the Ap horizon. Some pedons have faint mottles in the A2 horizon. Reaction ranges from strongly acid to neutral.

The Bt horizon has hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 2 through 4. It is silty clay loam or silty clay. The average clay content in the upper 20 inches of the Bt horizon ranges from 35 to 55 percent. This horizon has medium to very coarse subangular blocky or blocky structure or is organized into coarse or very coarse prisms. Reaction ranges from medium acid to neutral.

The C horizon has colors similar to those of the B horizon, except that hue ranges from 5YR to 2.5Y. The C horizon ranges from silty clay or clay to silt loam. It is commonly stratified or varved with silt, giving the appearance of platy structure. There are thin very fine sand varves in some pedons. Reaction ranges from neutral to moderately alkaline.

Ilion series

The Ilion series consists of deep, poorly drained soils on glacial till plains. These soils formed in glacial till deposits derived from calcareous gray shales and in lake-laid sediments mixed with glacial till deposits. Slope ranges from 0 to 3 percent.

The Ilion soils formed in the same kind of parent material as the associated moderately well drained Danley soils and the somewhat poorly drained Darien soils. The Ilion soils are also associated with the Honeoye, Lima, and Appleton soils, but are more poorly drained and have more clay in the subsoil than these soils.

Typical pedon of Ilion silt loam, in the town of Orchard Park, 1 mile south of the junction of U.S. Highway 20 and New York Highway 187 on the west side of New York Highway 187:

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam; moderate fine and medium granular structure; friable; many fine roots; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1g—9 to 13 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; common fine roots; common fine pores; 5 percent coarse fragments; slightly acid; clear wavy boundary.

B21tg—13 to 20 inches; dark grayish brown (2.5Y 4/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and few dark gray (5Y 4/1) mottles; moderate medium and coarse subangular blocky structure; firm; few roots in upper part only; common fine pores; clay films in all pores and on 10 percent of the ped faces; 10 percent coarse fragments; slightly acid; clear wavy boundary.

B22tg—20 to 29 inches; very dark grayish brown (2.5Y 3/2) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) and few olive gray (5Y 4/2) mottles; moderate medium and coarse blocky structure; firm; common fine pores; clay films in all pores and on 10 percent of the ped surfaces; ped faces are dark gray (5Y 4/1); 10 percent coarse fragments; neutral; gradual wavy boundary.

Cg—29 to 60 inches; very dark grayish brown (2.5Y 3/2) shaly silty clay loam; common medium distinct light olive brown (2.5Y 5/4) mottles; weak medium and thick platy structure; firm; few pores; 20 percent coarse fragments; few light brownish gray (2.5Y 6/2) streaks of lime on ped surfaces; calcareous; moderately alkaline.

The thickness of the solum ranges from 24 to 40 inches. Depth to carbonates ranges from 25 to 50 inches, and depth to bedrock ranges from 5 feet to more than 8 feet. Coarse fragments range from 0 to 15 percent by volume in the surface layer and upper part of the subsoil and from 10 to 35 percent in the lower part of the subsoil and in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 1. Texture is silt loam, loam, or silty clay loam. Structure is granular or blocky. Reaction ranges from medium acid to neutral.

The B1g horizon has hue of 5Y through 10YR, value of 4 through 6, and chroma of 1 or 2. Mottles range from few fine distinct to common medium prominent. Texture ranges from loam to light silty clay loam. The horizon has angular or subangular blocky structure. Reaction ranges from medium acid to neutral. The Btg horizon has hue of 5Y through 10YR, value of 3 through 6, and chroma of 1 or 2. Common to many, fine to coarse, distinct to prominent mottles of higher chroma cover less than 40 percent of the soil. The Btg horizon is clay loam or silty clay loam that is 28 to 35 percent clay or it is the shaly analogs of those textures.

The C horizon has hue of 5Y through 10YR, value of 3 through 5, and chroma of 1 or 2. The horizon is massive or has platy structure. It is silty loam or silty clay loam or the shaly analogs of those textures.

Kendaia series

The Kendaia series consists of somewhat poorly drained soils in areas of glacial till plains where runoff is received from higher adjacent soils. These soils formed in firm glacial till deposits. Slope ranges from 0 to 3 percent.

The Kendaia, Honeoye, Lima, and Lyons soils formed in similar parent material, but the Kendaia soils are more poorly drained than the Honeoye and Lima soils and are better drained than the Lyons soils. The Kendaia soils are also associated with the Cazenovia and Ovid soils but have a lower clay content in the subsoil and are not as red. The Kendaia soils are similar to Appleton soils, but do not have the clay accumulation in the subsoil.

Typical pedon of Kendaia silt loam, in the town of Alden, 0.2 mile north of railroad crossing on Town Line Road, 0.25 mile east of the road:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure parting to moderate fine granular; very friable; many fine and common medium roots; many medium pores; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—8 to 13 inches; brown (10YR 5/3) heavy silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; common medium and fine roots; common medium pores; grayish brown (10YR 5/2) ped faces; 5 percent coarse fragments; neutral; abrupt wavy boundary.

B22—13 to 20 inches; brown (10YR 4/3) heavy silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; common fine roots; 10 percent coarse fragments; neutral; abrupt wavy boundary.

B3—20 to 32 inches; dark reddish brown (5YR 4/2) heavy silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; medium coarse subangular blocky structure; very firm; few fine roots, 10 percent coarse fragments; mildly alkaline; clear wavy boundary.

C—32 to 60 inches; dark reddish brown (5YR 4/2) gravelly silt loam; moderate medium platy structure; very firm; 20 percent coarse fragments; calcareous; moderately alkaline.

The thickness of the solum ranges from 18 to 36 inches. Depth to carbonates ranges from 15 to 36 inches. Bedrock is more than 5 feet below the soil surface. Coarse fragments range from 5 to 15 percent by volume in the A horizon, from 5 to 30 percent in the B horizon, and from 15 to 30 percent in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR and value of 3 or 4. Texture is silt loam, loam, or fine sandy loam. Reaction ranges from medium acid to neutral.

The B horizon has hue of 10YR through 5YR, value of 4 or 5, and chroma of 2 through 4. Chroma is 2 or less in the matrix or on ped faces at a depth of less than 20 inches. The B horizon has common to many, fine to coarse mottles. It is fine sandy loam, loam, or silt loam or the gravelly analogs of those textures. Reaction ranges from slightly acid to mildly alkaline.

The C horizon ranges in hue from 10YR through 5YR and in value from 4 to 5. It is fine sandy loam, loam, silt loam, or the gravelly analogs of these textures. It is massive or has platy structure and is firm or very firm in consistence. Reaction is mildly alkaline or moderately alkaline.

Lakemont series

The Lakemont series consists of deep, poorly drained or very poorly drained soils in nearly level areas or in depressional areas of the lowland lake plain in the northern part of the county. These soils formed in reddish lacustrine deposits dominated by clay and silt. Slope ranges from 0 to 3 percent but is dominantly 0 to 1 percent.

The Lakemont soils formed in the same kind of parent material as the well drained and moderately well drained Schoharie soils and the somewhat poorly drained Odessa soils. They are associated with the Canandaigua, Getzville, Wayland, and Cheektowaga soils. The Lakemont soils have a higher clay content than the Canandaigua soils, are not underlain by sandy deposits as are the Getzville soils, are not subject to flooding as are the silty Wayland soils, and do not have the sandy mantle of the similarly drained Cheektowaga soils.

Typical pedon of Lakemont silt loam, in the town of Clarence, 0.6 mile south of the intersection of Keller and Strickler Roads:

Ap—0 to 9 inches; very dark brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2g—9 to 13 inches; gray (10YR 6/1) silty clay loam; common fine distinct brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; common fine pores; neutral; clear wavy boundary.

B21tg—13 to 18 inches; brown (7.5YR 5/2) silty clay; many medium distinct light gray (10YR 7/1) and strong brown (7.5YR 5/6) mottles; strong medium prismatic structure parting to moderate medium angular blocky; firm, plastic and sticky; few very fine pores; abundant gray (10YR 5/1) clay films on ped faces and lining all pores; neutral; clear wavy boundary.

B22tg—18 to 29 inches; dark reddish gray (5YR 4/2) silty clay; common medium distinct gray (N 6/1) and common medium faint reddish brown (5YR 4/4) mottles; strong medium angular blocky structure within strong coarse prisms; firm, very plastic and sticky; very few fine pores; continuous dark gray (5YR 4/1) clay films on ped faces; mildly alkaline; clear smooth boundary.

C—29 to 60 inches; reddish brown (5YR 4/3) silty clay loam; few medium faint reddish gray (5YR 5/2) mottles; moderate medium platy structure; firm; strongly calcareous, with white (10YR 8/1) lime segregated in streaks on ped (plate) surfaces; moderately alkaline.

The thickness of the solum ranges from 24 to 42 inches. Depth to carbonates ranges from 20 to 40 inches. Bedrock is more than 60 inches below the soil surface. There are generally no coarse fragments, but they range up to 5 percent of coarse fragments.

The Ap horizon is 10YR or 7.5YR in hue and 1 or 2 in chroma. Color value is 1 to 3 when moist and 5 or less when dry. Texture is mainly silt loam but also includes loam and silty clay loam, and in many areas it is mucky. Reaction is slightly acid or neutral. There is no A2 horizon in some deeply plowed areas, but when there is one it has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 or 2. Texture ranges from loam to silty clay loam. Reaction is slightly acid or neutral.

The B horizon has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 1 to 4. Ped faces have chroma of 2 or less, and mottles in the interior of peds are common to many and have chroma that is both higher and lower than that of the matrix. Texture ranges from silty clay loam to clay. The clay content of the Bt horizon ranges from 35 to 55 percent. Reaction is slightly acid or neutral, except it can be mildly alkaline in the lower part of the B horizon.

The C horizon has hue of 2.5YR to 7.5YR. It ranges from bedded clay and silt, giving the appearance of platy structure, to massive silty clay. Reaction is mildly alkaline or moderately alkaline.

Lamson series

The Lamson series consists of deep, poorly drained, and very poorly drained soils in depressions on glacial lake plains. These soils formed in sandy lake-laid deposits. Slope ranges from 0 to 3 percent.

The Lamson soils are associated with the Arkport, Galen, Minoa, Colonie, Elnora, and Canandaigua soils. The Lamson soils are wetter than the well drained Arkport soils, the moderately well drained Galen soils, and the somewhat poorly drained Minoa soils. They have a higher silt and clay content than the sandy Colonie and Elnora soils and are not as well drained. They are more sandy than the silty Canandaigua soils.

Typical pedon of Lamson very fine sandy loam, in the town of Amherst, near Hopkins Road and 0.6 mile north of New York Highway 263:

Ap—0 to 9 inches; very dark brown (10YR 3/1) very fine sandy loam, gray (10YR 5/1) dry; weak fine granular structure; very friable; many fine roots; slightly acid; abupt smooth boundary.

A2G—9 to 14 inches; light gray (10YR 6/1) loamy very fine sand; few fine distinct brown (7.5YR 4/4) mottles; single grain; loose; common fine roots; neutral; clear wavy boundary.

B21g—14 to 24 inches; brown (7.5YR 4/2) fine sandy loam; many fine and medium distinct yellowish brown (10YR 5/6) and faint brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; very few fine roots; neutral; clear wavy boundary.

B22g—24 to 40 inches; grayish brown (10YR 5/2) fine sandy loam varved with light gray (10YR 7/2) loamy fine sand and very fine sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles varves have few medium faint yellowish brown (10YR 5/4) mottles; weak medium and thick platy structure; friable; mildly alkaline; gradual smooth boundary.

C—40 to 50 inches; light brownish gray (10YR 6/2) loamy very fine sand; few fine faint brown (10YR 5/3) mottles; massive; very friable, compact in place; calcareous; moderately alkaline.

The thickness of the solum and depth to carbonates range from 30 to 50 inches. Depth to bedrock or contrasting material is more than 60 inches. From the base of the Ap horizon to a depth of 40 inches, the average clay content is less than 18 percent. There are commonly no coarse fragments, but some subhorizons have up to 10 percent gravel.

The Ap horizon has hue of 10YR to 7.5YR, value of 2 or 3, and chroma of 1 or 2. The value dry is 5 or less. Texture is mainly very fine sandy loam or mucky very fine sandy loam, but some pedons have fine sandy loam or silt loam textures in the surface layer. Reaction ranges from medium acid to mildly alkaline. The A2g horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 1 or 2 with few to common mottles. Structure ranges from weak, coarse subangular blocky to weak, medium granular to single grain. Consistence is loose, very friable, or friable. There is no A2g horizon in some places.

The B2g horizon has hue of 2.5Y to 7.5YR, value of 4 through 6, and chroma of 1 or 2. Chroma ranges to 3 or more at a depth of more than 30 inches. Texture is mainly fine sandy loam or very fine sandy loam. Consistence is friable or very friable. Reaction ranges from slightly acid to moderately alkaline. There is a B3 horizon in some profiles.

The C horizon has hue of 5Y to 5YR, value of 4 to 6, and chroma of 2 or 3. There are no mottles in some profiles. The C horizon has texture of fine sand to loamy very fine sand, and occasional strata of silt in some profiles. The material is massive or single grain. Reaction ranges from slightly acid to moderately alkaline.

Langford series

The Langford series consists of deep, moderately well drained and well drained soils on the upland plateau in the southern part of the county. These soils formed in glacial till deposits derived mainly from shale and limestone. In some areas the glacial till is underlain by lacustrine silt and clay. These soils have a dense fragipan in the lower part of the subsoil. Slope ranges from 3 to 25 percent.

The Langford soils formed in the same kind of parent material as the associated somewhat poorly drained Erie soils. They are also associated with the Mardin soils, which do not have the clay accumulation in the subsoil and are generally more acid. Where the Langford soils have a silty substratum, the Rhinebeck and Varysburg soils are nearby associates. The Langford soils are better drained than the Rhinebeck soils and not as high in clay content. They are more silty than the Varysburg soils and do not have the clayey substratum.

Typical pedon of Langford channery silt loam, 3 to 8 percent slopes, in the town of Concord, near Wagner Road and 300 feet west of Trevett Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) channery silt loam; moderate medium granular structure; very friable; many fine roots; 20 percent coarse fragments; slightly acid; abrupt smooth boundary.

B2—8 to 14 inches; yellowish brown (10YR 5/4) channery silt loam; weak medium subangular blocky structure; friable; many fine roots; many fine pores; 20 percent coarse fragments; medium acid; clear wavy boundary.

A'2—14 to 18 inches; light brownish gray (2.5Y 6/3) channery silt loam; common medium distinct yellowish brown (10YR 5/6) mottles occurring mainly along the boundary with Bx horizon; weak thin and medium platy structure; friable; common roots and pores; 25 percent coarse fragments; medium acid; abrupt irregular boundary.

Bx'1—18 to 29 inches; light olive brown (2.5Y 5/4) channery silt loam; few medium distinct yellowish brown (10YR 5/6) and few medium faint dark grayish brown (10YR 4/2) mottles; weak very coarse prismatic parting to weak medium subangular blocky structure; firm, brittle; few roots along prism faces; few fine pores, clay films lining many pores; fingers of A2 horizon material extending into this horizon along vertical prism faces with distinct strong brown (7.5YR 5/6) mottles or borders; 25 percent coarse fragments; slightly acid; gradual smooth boundary.

Bx'2—29 to 42 inches; dark grayish brown (2.5 4/2) channery silt loam; few medium faint light olive brown (2.5Y 5/4) mottles; weak coarse blocky structure with some platy structure in lower part; very firm in place, brittle; few fine pores; common clay films lining pores and along some ped faces; 30 percent coarse fragments; neutral; gradual wavy boundary.

C—42 to 60 inches; grayish brown (2.5Y 5/2) channery silt loam; weak thick platy structure; very firm; few pores; 30 percent coarse fragments; weakly calcareous; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches and commonly corresponds to the depth to carbonates. Depth to bedrock is more than 5 feet. Depth to the fragipan ranges from 15 to 24 inches. Coarse fragments range from 15 to 30 percent in the A horizon, 15 to 35 percent in the B horizon, and 20 to 60 percent in the Bx and C horizons. In areas where the substratum is silty, coarse fragment content ranges from 0 to 5 percent in the C horizon. These fragments include channery, flagstones, pebbles, and stones. They are commonly mixed with shale fragments.

The Ap horizon has hue of 2.5Y or 10YR, value of 3 to 5, and chroma of 2 or 3. Texture is channery silt loam to channery fine sandy loam. Structure is weak or moderate granular. Reaction ranges from strongly acid to neutral.

The B2 horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture ranges from silt loam to fine sandy loam in the fine earth fraction, and reaction ranges from strongly acid to neutral.

The A'2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. Texture ranges from fine sandy loam to light silt loam in the fine earth fraction and typically is noticeably coarser than that of the B'x horizon. Reaction ranges from strongly acid to neutral.

The B'x horizon has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture ranges from loam to silty clay loam in the fine earth fraction. The fragipan is firm to extremely firm. Reaction ranges from medium acid to neutral.

The C horizon has hue of 10YR through 5Y, value of 3 to 5, and chroma of 2 to 4. Texture ranges from loam or silt loam to silty clay loam in the fine earth fraction. This horizon is massive or has platy structure. It is firm or very firm, and reaction ranges from medium acid to moderately alkaline.

Lima series

The Lima series consists of deep, moderately well drained soils on glacial till plains. These soils formed in glacial till deposits derived mostly from gray limestone and gray alkaline shale. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Lima soils formed in the same kind of parent material as the associated well drained Honeoye soils and somewhat poorly drained Appleton soils. They are also associated with the Wassaic and Cazenovia soils. The Lima soils are deeper to bedrock than the Wassaic soils, and they have a lower clay content than the Cazenovia soils and are not as red.

Typical pedon of Lima loam, 0 to 3 percent slopes, in the town of Newstead, 1.8 miles east of the village of Clarence near Millgrove Road and 0.5 mile south of New York Highway 5:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, weak fine and medium granular structure; friable; many fine roots; 12 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2—9 to 11 inches; light brownish gray (10YR 6/2) loam; few medium faint brown (10YR 5/3) mottles; very weak medium platy structure; friable; many fine roots and pores; 10 percent coarse fragments; slightly acid; clear irregular boundary.

B&A—11 to 15 inches; brown (7.5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; grayish brown (10YR 5/2) fingers of A2 material extend into this horizon along vertical ped faces and surrounding some peds; few medium faint yellowish brown (10YR 5/4) mottles in ped interiors; common fine roots; common fine pores, some pores on the interiors of peds lined with clay films; 10 percent coarse fragments; slightly acid; gradual wavy boundary.

B21t—15 to 20 inches; brown (7.5YR 4/4) silt loam; few medium faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; few fine pores; common medium brown (10YR 4/3) clay films on ped faces and in pores; 10 percent coarse fragments; neutral; gradual wavy boundary.

B22t—20 to 26 inches; brown (7.5YR 4/4) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few roots; few fine pores; dark reddish gray (5YR 4/2) clay films on many ped faces and in pores; 10 percent coarse fragments; mildly alkaline; clear wavy boundary.

C—26 to 60 inches; brown (7.5YR 5/2) gravelly silt loam; few medium faint brown (7.5YR 5/4) mottles; weak medium and coarse platy structure; firm; few fine pores; pinkish gray (7.5YR 7/2) streaks of lime segregated on plate faces; 20 percent coarse fragments; calcareous; moderately alkaline.

The thickness of the solum and depth to carbonates range from 18 to 30 inches. Depth to bedrock is more than 5 feet. Coarse fragments increase as depth increases and range from 5 to 15 percent by volume in the Ap horizon, from 5 to 35 percent in the A2 and B horizon, and from 15 to 50 percent in the C horizon. The coarse fragments are mainly limestone, shale, and sandstone.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. When crushed and dry, value is lighter than 5.5. Texture is loam, silt loam, or fine sandy loam. Structure is weak or moderate granular. Reaction ranges from medium acid to mildly alkaline. The A2 horizon, if present, has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2 to 5. This horizon is fine sandy loam, loam, or silt loam or the gravelly analogs of those textures. Structure is platy or blocky. Reaction ranges from medium acid to mildly alkaline.

The Bt horizon has hue of 5YR to 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is loam or silt loam or the gravelly analogs of those textures and averages 18 to 28 percent clay. Structure is weak to moderate, fine or medium subangular blocky, and consistence is friable or firm. Reaction ranges from medium acid to mildly alkaline. The lower part of the B horizon is calacareous in some pedons.

The C horizon is 5YR to 2.5Y in hue and 4 or 5 in value. It is firm or very firm in consistence. It is fine sandy loam, loam, or silt loam or the gravelly or very gravelly analogs of those textures. Reaction is mildly alkaline or moderately alkaline.

Lyons series

The Lyons series consists of deep, poorly drained and very poorly drained soils on flats or in concave depressions on till plains. These soils formed in glacial till deposits derived from limestone, calcareous shale, and sandstone. In some places, local colluvium mantles the till deposits. Slope ranges from 0 to 3 percent.

The Lyons soils formed in the same kind of parent material as the nearby somewhat poorly drained Appleton soils and the moderately well drained Lima soils. The Lyons soils are also associated with the Erie and Derb soils but do not have the fragipan of the Erie soils and are not as well drained or as acid as the Derb soils.

Typical pedon of Lyons silt loam in the town of Alden, 0.4 mile west of the Genesee County line and 40 feet south of New York Highway 33:

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, gray (10YR 5/1) dry; moderate medium granular structure; very friable, slightly sticky; many fine and very fine roots; neutral; abrupt smooth boundary.

B2—9 to 15 inches; brown to dark brown (7.5YR 4/2) silt loam; common medium faint brown (7.5YR 5/4) and distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, slightly sticky; few very fine roots; common fine pores; brown (7.5YR 5/2) ped faces; neutral; gradual wavy boundary.

B3g—15 to 32 inches; grayish brown (10YR 5/2) heavy silt loam; common medium distict light gray to gray (2.5Y 6/0) and few to common medium distinct yellowish brown (10YR 5/4) mottles; moderate coarse subangular blocky structure; very firm, slightly sticky; few very fine roots and pores; grayish brown (2.5Y 5/2) ped faces; 5 percent coarse fragments; mildly alkaline; gradual wavy boundary.

C1—32 to 45 inches; brown (7.5YR 5/2) heavy silt loam; common medium prominent strong brown (7.5YR 5/6) and gray (5Y 5/1) mottles; massive; very firm, slightly sticky; 10 percent coarse fragments; strongly effervescent; abrupt wavy boundary.

IIC2—45 to 65 inches; dark grayish brown (10YR 4/2) silty clay loam; massive; very firm, sticky; 10 percent coarse fragments; strongly effervescent.

The thickness of the solum ranges from 20 to 40 inches. Depth to carbonates ranges from 23 to 40 inches. Coarse fragments range from 0 to 15 percent by volume in the A horizon, from 5 to 30 percent in the B horizon, and from 5 to 60 percent in the C horizon. The average clay content at a depth of 10 to 40 inches is between 18 and 28 percent. Bedrock is at a depth of more than 5 feet.

The Ap horizon has value of 2 or 3 and chroma of 0 to 2. Dry value is 5 or less. Texture is mainly silt loam but ranges from fine sandy loam to silty clay loam with mucky analogs common in some pedons. Consistence is friable or very friable. Reaction ranges from medium acid to neutral.

The Bg horizon has hue of 5YR to 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is fine sandy loam to silty clay loam, commonly with gravelly analogs of those textures. The Bg horizon has angular blocky or prismatic structure and friable or firm consistence. Reaction ranges from slightly acid to mildly alkaline.

The C horizon has colors similar to those of the B horizon. It ranges from fine sandy loam to silty clay loam or the gravelly or very gravelly analogs of those textures. Consistence is firm or very firm. Reaction is mildly alkaline or moderately alkaline.

Manlius series

The Manlius series consists of moderately deep, excessively drained to well drained soils on till plains where the topography is influenced by the underlying bedrock. These soils formed in glacial till derived mainly from acid shale bedrock. Bedrock is at a depth of 20 to 40 inches. Slope ranges from 0 to 50 percent but is dominantly 3 to 8 percent.

The Manlius soils are near the Orpark, Derb, Schuyler, Hornell, and Marilla soils. The Manlius soils are better drained and have less clay than the Orpark, Derb, Schuyler, and Hornell soils. They are not as deep to bedrock as the Marilla soils and do not have the fragipan.

Typical pedon of Manlius shaly silt loam, 3 to 8 percent slopes, in the town of Orchard Park, near New York Highway 277 at the intersection of Gartman Road near Chestnut Ridge Park:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) shaly silt loam; weak fine granular structure; very friable; many roots; 30 percent coarse fragments; slightly acid (limed); abrupt smooth boundary.

B2—8 to 21 inches; yellowish brown (10YR 5/4) very shaly silt loam; very weak fine subangular blocky structure; friable; common fine roots; common fine pores; 40 percent coarse fragments; strongly acid; clear wavy boundary.

C—21 to 31 inches; brown (10YR 4/3) very shaly silt loam; very weak medium platy structure; friable; very few roots; common pores; 60 percent coarse fragments; strongly acid; abrupt wavy boundary.

R—31 inches; very dark grayish brown (2.5YR 3/2) to very dark gray (10YR 3/1) shale bedrock; brittle; strongly acid.

The thickness of the solum ranges from 20 to 30 inches. Bedrock is at a depth of 20 to 40 inches. Coarse fragments, mainly shale, range from 15 to 40 percent in the Ap horizon and increase with depth to as much as 60 percent in the C horizon. In some pedons, there is no C horizon, and the solum rests directly on bedrock.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is silt loam or loam or the shaly or very shaly analog of those textures. Reaction ranges from extremely acid to strongly acid, unless the soil is limed.

The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 through 6. Some profiles have few to common faint mottles below a depth of 20 inches. The B horizon is very shaly silt loam or very shaly loam. Reaction ranges from extremely acid to strongly acid.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4. This horizon is massive, or it has platy structure. Consistence is very friable to firm. Reaction ranges from strongly acid to slightly acid.

The R horizon in some areas has thin layers of nonbrittle clayey shale.

Mardin series

The Mardin series consists of deep, moderately well drained soils on the upland plateau in the southern part of the county. These soils formed in glacial till deposits derived mainly from acid shale and sandstone. They have a dense fragipan in the lower part of the subsoil. Slope ranges from 3 to 50 percent but is dominantly 3 to 15 percent.

The Mardin soils formed in the same kind of parent material as the nearby somewhat poorly drained Volusia soils and the poorly drained Chippewa soils. Other associated soils include the Langford, Erie, Valois, and Schuyler soils. The Mardin soils do not have the clay accumulation in the subsoil of the similar moderately well drained and well drained Langford soils and the somewhat poorly drained Erie soils. They have a fragipan and are not as well drained as the Valois soils, and they are deeper to bedrock and have a slightly lower clay content than the Schuyler soils.

Typical pedon of Mardin channery silt loam, 3 to 8 percent slopes, in the town of Concord, off the Brown Hill Road and 1.0 mile northeast of Wyandale Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) channery silt loam; weak medium granular structure; very friable; many fine roots; 20 percent coarse fragments; medium acid; abrupt smooth boundary.

B2—8 to 13 inches; yellowish brown (10YR 5/6) channery silt loam; weak fine subangular blocky structure; friable; common fine roots and pores; 15 percent coarse fragments; strongly acid; clear wavy boundary.

A'2—13 to 16 inches; pale brown (10YR 6/3) channery silt loam; common medium faint yellowish brown (10YR 5/6) mottles; very weak medium platy structure; firm; common fine roots; common fine pores; 20 percent coarse fragments; strongly acid; abrupt irregular boundary.

Bx1—16 to 29 inches; light olive brown (2.5Y 5/4) channery loam; common medium faint light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; strong very coarse prisms separated by thin streaks of pale brown (10YR 6/3) silt; distinct coarse yellowish brown (10YR 5/8) mottles at the sides of silt streaks; very firm and brittle; few fine roots along prism faces; few fine pores, some with clay film linings; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx2—29 to 50 inches; olive brown (2.5Y 4/4) very channery loam; common medium faint dark grayish brown, (10YR 4/2) and distinct yellowish brown (10YR 5/8) mottles; strong very coarse prisms separated by thin streaks of pale brown (10YR 6/3) silt; distinct coarse yellowish brown (10YR 5/8) mottles at the sides of silt streaks; very firm and brittle; few fine pores, some with clay film linings; 35 percent coarse fragments; medium acid; gradual wavy boundary.

C—50 to 60 inches; olive brown (2.5Y 4/4) very channery loam; common fine faint dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) mottles; massive; very firm; 40 percent coarse fragments; slightly acid.

The thickness of the solum ranges from 40 to 70 inches. Depth to the fragipan ranges from 14 to 26 inches, and depth to bedrock ranges from 60 inches to many feet. The average clay content of the fine earth fraction above the fragipan is less than 18 percent. Coarse fragments, dominantly sandstone and siltstone fragments, range from 5 to 35 percent in the horizons above the fragipan and from 20 to 60 percent in the Bx and C horizons.

The Ap horizon has hue of 2.5Y or 10YR, value of 3 or 4, and chroma of 2 through 4. It is loam or silt loam or the channery or flaggy analogs of those textures. Structure is weak or moderate, fine or medium granular. Consistence is friable or very friable. Reaction ranges from extremely acid to slightly acid.

The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 through 6. It is loam or silt loam or is commonly the channery or gravelly analogs of those textures. Structure is very weak through moderate, very fine through medium subangular blocky or granular. Mottling, if present, is faint. 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. This horizon is loam or silt loam and is commonly the channery or gravelly analogs of those textures. Structure ranges from weak or very weak platy to subangular blocky, or the horizon is massive. It has friable or firm consistence. Reaction ranges from extremely acid to slightly acid.

The B'x horizon has hue of 10YR through 5Y, value of 3 through 5, and chroma of 2 through 4. Texture is channery or very channery loam or silt loam. The B'x horizon has firm or very firm consistence and is brittle. Reaction increases in pH with depth and ranges from very strongly acid to neutral.

The C horizon has hue of 10YR through 5Y, value of 3 through 5, and chroma of 2 through 4. It is massive, or it has weak platy structure. Consistence is firm or very firm. The C horizon usually contains more coarse fragments than the B'x horizon. Reaction ranges from strongly acid to moderately alkaline.

Marilla series

The Marilla series consists of deep, moderately well drained soils at the fringe of the upland plateau and in a few isolated areas of the lowland plain. These soils formed in shaly glacial till deposits. They have a dense fragipan layer in the subsoil. Slope ranges from 0 to 15 percent but is dominantly 3 to 8 percent.

The Marilla soils are associated with the Derb, Manlius, Mardin, and Volusia soils. The Marilla soils have a higher shale content than the Mardin soils, are better drained than the Volusia soils, and are deeper to bedrock than the Manlius soils. They are better drained than the Derb soils and have a fragipan that those soils do not have.

Typical pedon of Marilla shaly silt loam, 0 to 3 percent slopes, in the town of Orchard Park, near Scherff Road and 1.5 miles south of New York Highway 250:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) shaly silt loam, weak medium granular structure; very friable; many roots; 20 percent coarse fragments; strongly acid; abrupt smooth boundary.

B2—8 to 18 inches; yellowish brown (10YR 5/4) shaly silt loam; few fine faint light olive brown (2.5Y 5/6) mottles in lower part; weak fine subangular blocky structure; friable; many fine roots; many fine pores; 20 percent coarse fragments; strongly acid; clear wavy boundary.

Bx—18 to 42 inches; olive brown (2.5Y 4/4) shaly silt loam; distinct prisms 10 to 16 inches in diameter; firm, brittle; streaks of light gray (10YR 6/1) bordered by thin distinct strong brown (7.5YR 5/6) color along prism faces; common medium distinct light olive brown (2.5Y 5/8) mottles within prisms; few roots in upper part; few fine pores with thin clay lining; 25 percent coarse fragments; strongly acid; gradual smooth boundary.

C—42 to 60 inches; olive gray to dark olive gray (5Y 4/2) very shaly silt loam; many medium distinct light olive brown (2.5Y 5/4) and grayish brown (10YR 5/2) mottles; massive; firm; very few pores; 40 percent coarse fragments; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Depth to the top of the fragipan ranges from 15 to 25 inches. Coarse fragments, consisting mostly of thin brittle shale fragments, range from 20 to 35 percent in horizons above the fragipan and from 20 to 50 percent in the fragipan and underlying substratum. Shale bedrock is deeper than 5 feet.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 through 4. It is shaly silt loam or shaly loam. Structure is weak to moderate, very fine to medium granular. Consistence is friable or very friable. Reaction is strongly acid or very strongly acid, unless the soil is limed.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 through 6 with distinct or prominent high-chroma mottles below 12 to 18 inches. Texture is shaly loam or shaly silt loam. Structure ranges from very weak, fine granular through weak, fine subangular blocky in the upper part and from weak, fine subangular blocky through weak, thick or medium platy in the lower part. Reaction is strongly acid or very strongly acid. The Bx horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 2 or 3. It is shaly or very shaly loam or silt loam. Consistence is firm or very firm. Reaction is strongly acid to slightly acid.

The C horizon has hue of 10YR to 5Y and value of 4 or 5. It is a very shaly or shaly loam or silt loam. Structure is platy, or the material is massive. Consistence is firm or very firm. Reaction is slightly acid through strongly acid.

Middlebury series

The Middlebury series consists of deep, moderately well drained to somewhat poorly drained soils on nearly level flood plains and on a few alluvial fans. These soils formed in alluvial deposits derived from upland soils having a high component of shale and sandstone. Slope ranges from 0 to 3 percent.

The Middlebury soils formed in the same kind of parent material as the associated well drained Tioga soils. The Middlebury soils are also associated with the Hamlin, Teel, Wayland, and Chenango soils. They have a higher content of fine sand than the Hamlin and Teel soils and are better drained than the more clayey Wayland soils. The Middlebury soils have less sand and gravel than the Chenango soils on adjacent landforms and are not as well drained.

Typical pedon of Middlebury silt loam, in the town of Aurora, 0.6 mile southeast of Blakeley Road near New York Highway 16, behind barn west of highway:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; very friable; common roots; medium acid; clear smooth boundary.

B21—9 to 14 inches; dark brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; common roots; medium acid; gradual smooth boundary.

B22—14 to 28 inches; dark brown (10YR 4/3) silt loam; many medium distinct yellowish brown (10YR 5/6) and common coarse distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; common roots; medium acid; clear wavy boundary.

B23—28 to 37 inches; dark brown (10YR 4/3) very fine sandy loam; few medium distinct grayish brown (2.5Y 5/2) and few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few roots; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

IIC1—37 to 47 inches; dark brown (10YR 3/3) stratified layers of medium and fine sand and coarse silt; few medium distinct grayish brown (2.5Y 5/2) and few medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; few roots; slightly acid; clear smooth boundary.

IIIC2—47 to 60 inches; dark brown (10YR 3/3) stratified layers of fine sand and gravel; common coarse distinct gray (10YR 5/1) mottles fringed with strong brown (7.5YR 5/6); massive; friable; 10 percent coarse fragments; slightly acid.

The thickness of the solum ranges from 15 to 45 inches. Bedrock is deeper than 5 feet. Coarse fragments range from 0 to 10 percent in the A horizon, from 0 to 20 percent in the B horizon, and from 0 to 40 percent in the C horizon.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. It is dominantly silt loam, but some pedons include loam or fine sandy loam. It has weak or moderate fine to coarse granular structure, and it is friable or very friable. Reaction is strongly acid to slightly acid.

The B horizon has hue of 10YR through 5Y, value of 4 or 5, and chroma of 3 or 4. High-chroma mottles can occur in all subhorizons. Common to many low- and high-chroma mottles occur in the lower part of the B horizon within 24 inches of the soil surface. Texture ranges from gravelly fine sandy loam to silt loam. The B horizon has weak or moderate, medium or coarse subangular blocky or prismatic structure and is friable or very friable. Reaction is medium acid to neutral.

The C horizon has hue of 10YR through 5Y, value of 4 or 5, and chroma of 2 through 4. There are few to many high- and low-chroma mottles. Texture ranges from fine sandy loam to silt loam in the fine earth fraction to a depth of less than 40 inches but is dominantly stratified sand and gravel below 40 inches. The C horizon has friable or firm consistence. Reaction is medium acid to neutral.

Minoa series

The Minoa series consists of deep, somewhat poorly drained soils on remnant deltas and beaches on the lowland lake-plain in the northern and western parts of the county. These soils formed in lake-laid deposits having a high content of very fine sand and fine sand. These soils also occur in the southern portion of the county in association with steeper, sandy soils that formed in glacial outwash deposits. Slope ranges from 0 to 3 percent.

The Minoa soils formed in the same kind of parent material as the associated well drained Arkport soils, moderately well drained Galen soils, and poorly drained and very poorly drained Lamson soils. The Minoa soils are also near the Cosad, Swormville, Palmyra, and Blasdell soils. They do not have the clayey substratum of the Cosad soils, do not have the clayey surface mantle of the Swormville soils, and are not as gravelly or as well drained as the Palmyra and Blasdell soils.

Typical pedon of Minoa very fine sandy loam, in the town of Amherst, near French Road and west of Got Creek:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, light brownish gray (10YR 6/2) dry and crushed; moderate fine granular structure; very friable; many fine roots; slightly acid.

B21—9 to 14 inches; light yellowish brown (10YR 6/4) very fine sandy loam; common fine faint strong brown (7.5YR 5/6) and light brownish gray (10YR 6/1) mottles; very weak fine subangular blocky structure; very friable; common fine roots; common pores; medium acid; clear wavy boundary.

B22—14 to 24 inches; pale brown (10YR 6/3) loamy very fine sand; common medium distinct strong brown (7.5YR 5/6) mottles; very weak very fine granular structure; very friable; few fine roots; common fine pores; slightly acid; clear wavy boundary.

B3—24 to 40 inches; grayish brown (10YR 5/2) loamy very fine sand; many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; massive; very friable; few fine pores, neutral; clear wavy boundary.

C—40 to 60 inches; light brownish gray (10YR 6/2) loamy very fine sand; common medium distinct dark yellowish brown (10YR 4/4) and strong brown (7.5YR 5/6) mottles; massive; friable; few fine pores; mildly alkaline; abrupt smooth boundary.

The thickness of the solum ranges from 20 to 40 inches. These soils typically are free of stones and gravel, but some subhorizons may contain up to 5 percent coarse fragments. Bedrock is at a depth of more than 5 feet.

The Ap horizon has hue of 2.5Y through 7.5YR, value of 3 or 4, and chroma of 2 or 3. It is very fine sandy loam, silt loam, or loamy very fine sand. Reaction is strongly acid to neutral.

The B2 horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 2 through 4. The B2 horizon ranges in texture from silt loam through loamy very fine sand and fine sandy loam. It has very weak or weak granular or subangular blocky structure, or it is massive. Consistence is very friable through firm.

Reaction is strongly acid to neutral. If there is a B3 horizon, it has hue of 5YR through 2.5Y, value of 4 or 5, and chroma of 2 through 4. Texture ranges from silt loam through loamy very fine sand. Structure ranges from very weak or weak granular to subangular blocky, or the material is massive. Consistence is loose or friable. Reaction ranges from medium acid through neutral.

The C horizon has hue of 2.5Y through 5YR, value of 4 to 6, and chroma of 2 to 4. Texture ranges from silt loam to loamy fine sand, and thin varves of silty clay or fine sand are in some pedons. Reaction ranges from medium acid to neutral to a depth of 40 inches and from slightly acid to moderately alkaline at a depth of more than 40 inches.

Newstead series

The Newstead series consists of moderately deep, somewhat poorly drained soils in nearly flat areas where the landscape is influenced by the underlying bedrock. These soils formed in glacial till deposits derived dominantly from limestone but containing some sandstone, shale, and granite fragments. Slope ranges from 0 to 3 percent.

The Newstead soils formed in the same kind of parent material as the well drained and moderately well drained Wassaic soils. They are associated with the Appleton, Kendaia, Lyons, Benson, and Farmington soils. The Newstead soils are not as deep to bedrock as the Appleton and Kendaia soils. They are somewhat better drained than the Lyons soils and not as deep to bedrock. They are more poorly drained and slightly deeper to bedrock than the Benson and Farmington soils.

Typical pedon of Newstead loam, in the town of Clarence, 0.4 mile north of New York Highway 5 and 130 feet east of Thompson Road:

Ap—0 to 10 inches; black (10YR 2/1) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many roots; 10 percent coarse fragments; neutral; abrupt smooth boundary.

A2—10 to 13 inches; pale brown (10YR 6/3) fine sandy loam; common medium faint yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; common roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B2—13 to 21 inches; dark brown (7.5YR 4/4) loam; many medium distinct strong brown (7.5YR 5/6) and common medium distinct brown (7.5YR 5/2) mottles; moderate coarse subangular blocky structure; friable; common roots; light brownish gray (10YR 6/2) ped faces; 5 percent coarse fragments; neutral; clear wavy boundary.

C—21 to 27 inches; reddish brown (5YR 5/3) gravelly loam; common medium faint strong brown (7.5YR 5/6) and few fine faint pinkish gray (7.5YR 6/2) mottles; massive; firm; few roots; 15 percent coarse fragments between 1/2 to 1 inch in diameter, 5 percent flagstones; strongly effervescent, moderately alkaline.

IIR—27 inches; hard, gray, limestone bedrock.

The thickness of the solum ranges from 12 to 30 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments range from 2 to 15 percent in the A horizon, 2 to 35 percent in the B horizon, and 15 to 50 percent in the C horizon. Texture of the fine earth fraction in all horizons ranges from sandy loam through silt loam.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It has weak or moderate, fine or medium granular structure and is friable or very friable. Reaction ranges from medium acid to mildly alkaline. There is no A2 horizon in some pedons.

The B horizon has hue of 7.5YR through 2.5Y, value of 3 to 5, and chroma of 2 to 4. It is friable or firm. Reaction ranges from slightly acid to moderately alkaline.

The C horizon has hue of 5YR through 2.5Y, value of 3 to 5, and chroma of 2 to 4. It is massive, or it has weak or moderate platy structure. It is friable or firm. There is no C horizon in some pedons. Reaction ranges from neutral to moderately alkaline.

The bedrock or R horizon is calcitic or domomitic limestone or calcareous sandstone.

In the survey area these soils are a taxadjunct to the Newstead series because they have a thicker black surface layer and redder hue in the substratum than defined for the series. These differences do not affect the use and management of the soils.

Niagara series

The Niagara series consists of deep, somewhat poorly drained soils that are mostly on the lowland lake plains in the northern and western portion of the county, but a few isolated areas are in the southern part of the county. These soils formed in silty lacustrine sediments which were laid down in former glacial lakes. Some are on silty alluvial fans along valley bottoms. A few areas of the Niagara soils have a glacial till substratum. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Niagara soils formed in the same kind of parent material as the associated moderately well drained Collamer soils and the poorly drained and very poorly drained Canandaigua soils. In some areas, the Niagara soils are near the Churchville soils that have a high clay content. Other associated soils include the Cosad, Raynham, Swormville, and Odessa soils. The Niagara soils do not have the sandy mantle of the Cosad soils, have a higher clay content in the subsoil than the

Raynham soils, do not have the sandy substratum of the Swormville soils, and do not have as high a clay content as the Odessa soils.

Typical pedon of Niagara silt loam, 0 to 3 percent slopes, in the town of Lancaster, 0.2 mile west of the intersection of Ransom Road and Erie Street, 240 feet south of Erie Street:

Ap—0 to 11 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots and pores; slightly acid; abrupt smooth boundary.

B1—11 to 16 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct strong brown (7.5YR 5/6) and few fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; many very fine roots and pores; common worm channels filled with dark brown material; slightly acid; abrupt wavy boundary.

B21t—16 to 21 inches; dark brown (7.5YR 4/2) light silty clay loam; many medium distinct strong brown (7.5YR 5/6) and few fine distinct grayish brown (2.5Y 5/2) mottles; moderate coarse and medium subangular blocky structure; firm; few fine roots; few very fine pores; many moderately thick brown (10YR 4/3) clay films on ped faces and in pores; mildly alkaline; clear wavy boundary.

B22t—21 to 27 inches; dark brown (7.5YR 4/4) silt loam; common medium distinct strong brown (7.5YR 5/6), few fine distinct grayish brown (2.5Y 5/2), and few medium faint dark brown (7.5Y 4/2) mottles; moderate coarse and medium subangular blocky structure; firm; few very fine and fine roots and pores; common moderately thick brown (10YR 4/3) clay films on ped faces and in pores; mildly alkaline; gradual wavy boundary.

C—27 to 60 inches; dark brown (10YR 4/3) silt loam; few medium distinct strong brown (10YR 5/6) and common fine distinct gray (5Y 6/1) mottles; moderate very coarse prismatic structure parting to moderate medium platy; firm; very few very fine roots along prism faces; few very fine pores; continuous thick olive gray (5Y 5/2) silt coatings on prism faces, bordered on both sides by oxidized yellowish brown (10YR 5/6) bands 3 to 5 millimeters thick; lime concretions 2 to 20 millimeters thick; calcareous; moderately alkaline; clear wavy boundary.

IIC—60 to 72 inches; olive brown (2.5Y 4/4) coarse silt and very fine sand; massive; strongly effervescent; strongly calcareous.

The thickness of the solum ranges from 20 to 40 inches. Depth to carbonates is 20 to 50 inches. The solum is typically free of gravel, but any one subhorizon can contain as much as 3 percent coarse fragments by volume. Bedrock is at a depth of more than 5 feet.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 5, and chroma of 2 or 3. Dry value is more than 5.5. Texture is silt loam, very fine sandy loam, or loam. Reaction is strongly acid to neutral.

The B1 horizon has hue ranging from 7.5YR to 2.5Y, value of 5 or 6, and chroma of 3 or 4. Texture is very fine sandy loam to silt loam. This horizon has weak or moderate subangular blocky structure. In some pedons, an A2 horizon replaces the B1 horizon and differs from the B1 horizon in having chroma ranging to 2, structure that is weak subangular blocky or platy, and consistence that is friable. Reaction is medium acid to mildly alkaline. The B2t horizon has hue ranging from 5YR to 2.5Y and value of 4 or 5. Chroma of 2 or less are dominant on the ped faces. Texture is silt loam, very fine sandy loam, or silty clay loam. Clay content averages 18 to 35 percent. Reaction ranges from medium acid to mildly alkaline.

The C horizon has hue ranging from 2.5Y to 5YR, value of 3 to 5, and chroma of 2 to 4. It is very fine sandy loam, silt loam, or silty clay loam and is commonly stratified with layers of fine sand, silt, or clay. Glacial till or gravelly layers occur at a depth of 40 to 60 inches in some pedons. Reaction ranges from neutral to moderately alkaline.

Odessa series

The Odessa series consists of deep, nearly level, somewhat poorly drained soils on the lowland plain in the northern part of the county. The soils formed in red glacial lake sediments high in content of clay and silt. Slope ranges from 0 to 3 percent but is dominantly 0 to 2 percent.

The Odessa soils formed in the same kind of parent material as the poorly drained and very poorly drained Lakemont soils and the well drained and moderately well drained Schoharie soils. They are associated with and similar to the Churchville, Niagara, Cosad, Ovid, and Rhinebeck soils. The Odessa soils are not underlain with loamy glacial till deposits at a depth of less than 40 inches as are the Churchville soils. They have a higher clay content than the Niagara soils, do not have the sandy mantle of the Cosad soils, do not have the coarse fragments that are in the Ovid soils, and are more red than the gray Rhinebeck soils.

Tyical pedon of Odessa silt loam, in the town of Amherst, near Audubon development at elementary school site:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B21t—9 to 13 inches; pinkish gray (7.5YR 6/2) silty clay; many medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common roots; gray (10YR 5/1) ped faces; clay films on ped faces; medium acid; clear wavy boundary.

B22t—13 to 22 inches; reddish brown (5YR 5/3) silty clay; common fine distinct strong brown (7.5YR 5/6) and common medium distinct gray (5YR 5/1) mottles; strong coarse prismatic structure parting to moderate medium angular blocky; firm, plastic and slightly sticky; few roots; light brownish gray (10YR 6/2) ped faces; clay linings in pores and continuous on ped faces; neutral; clear wavy boundary.

C1—22 to 55 inches; reddish brown (2.5YR 5/4) varved with thin bands of gray (5YR 5/1) and reddish gray (5YR 5/2) silty clay; moderate very coarse prismatic structure parting to moderate medium platy; firm; few roots along prism faces; gray (5YR 5/1) ped faces; secondary carbonate accumulations in the top 6 inches of horizon; gypsum crystals in the lower part of horizon; plastic and slightly sticky; weakly effervescent; mildly alkaline; clear wavy boundary.

C2—55 to 60 inches; gray (5YR 5/1-6/1) varved with weak red (2.5YR 4/2) silty clay; massive; firm, plastic and slightly sticky; manganese stains occurring within peds; weakly effervescent; mildly alkaline.

The thickness of the solum ranges from 20 to 45 inches. Depth to carbonates ranges from 17 to 45 inches. Bedrock is at a depth of more than 5 feet. These soils typically are free of coarse fragments, but some subhorizons may contain up to 5 percent by volume.

The Ap horizon has hue of 7.5YR or 10YR and is 2 or 3 in chroma. It ranges from 3 to 5 in value when moist and is more than 5.5 when dry. Texture is silt loam, loam, or silty clay loam. Reaction ranges from medium acid to neutral. When there is an A2 horizon, it has hue similar to the Ap horizon with value of 5 to 7 and chroma of 2. Texture is silt loam or silty clay loam.

The B2 horizon has hue of 5YR to 2.5YR, value of 3 to 6, and chroma of 2 to 4, except some subhorizons have 7.5YR hue. Mottles of low chroma range from common to many. Texture is silty clay loam to clay. Structure is weak to strong prismatic or moderate to strong blocky. There is a B3 horizon in some profiles. Reaction ranges from medium acid to mildly alkaline.

The C horizon has hue of 2.5YR to 10YR, value of 3 to 6, and chroma of 1 to 4. Texture is silty clay or clay that is often varved with silt or clay. Reaction is mildly alkaline or moderately alkaline.

Orpark series

The Orpark series consists of moderately deep, somewhat poorly drained soils on plateau crests and summits in the uplands. These soils formed in a thin mantle of glacial till underlain by weathered soft shale bedrock. Slope ranges from 0 to 15 percent but is dominantly 0 to 8 percent.

The Orpark soils are associated with the Derb, Hornell, and Angola soils on similar landforms. The Orpark soils are shallower to bedrock than the Derb soils, have less clay in the subsoil than the Hornell soils, and do not have the clay accumulation in the subsoil that is in the Angola soils. They are also associated with the Blasdell and Farnham soils. The Orpark soils have a lower shale fragment content than the better drained Blasdell and Farnham soils.

Typical pedon of Orpark silty clay loam, 0 to 3 percent slopes, in the town of Eden, in a field on the north side of Eckhardt Road, 0.3 mile east of Eden Road:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam; moderate fine granular structure; friable; many fine roots; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B21—9 to 13 inches; light olive brown (2.5Y 5/4) silty clay loam; few medium faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common fine roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—13 to 22 inches; olive brown (2.5Y 4/4) silty clay loam; common medium faint light olive brown (2.5Y 5/6) and few medium distinct gray (5Y 5/1) mottles; weak medium subanguar blocky structure; friable; few fine roots; faces of peds are brown (2.5Y 5/2); 10 percent coarse fragments; very strongly acid; clear wavy boundary.

C—22 to 27 inches; pale olive (5Y 6/3) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak thin subangular blocky structure; firm; few fine roots; light olive gray (5Y 6/2) silt coatings on ped faces; 10 percent coarse fragments; very strongly acid; abrupt smooth boundary.

IIR—27 inches; olive (5Y 5/3) soft shale bedrock interbedded with thin, dark gray, somewhat harder strata; very strongly acid.

The thickness of the solum ranges from 20 to 32 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments, dominantly soft shale, range from 0 to 10 percent in the solum and make up as much as 20 percent of thin subhorizons in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 through 3. It is loam, silt loam, or silty clay loam. Structure is weak or moderate, fine or medium granular, and consistence is very friable or friable. Undisturbed pedons have a black or very dark grayish brown A1 horizon 2 to 5 inches thick. Reaction is very strongly acid or strongly acid.

The B horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 2 through 4 with some subhorizons having dominant chroma of 3 or more within 30 inches of the soil surface. Texture is silt loam or silty clay loam. Structure is weak or moderate, fine to coarse subangular blocky or prismatic parting to subangular blocky. Consistence is friable or firm. Reaction is very strongly acid or strongly acid.

The C or Cr horizon is 1 to 6 inches thick and has color similar to the B horizon. Texture is silt loam or light silty clay loam in the fine earth fraction. Platy structure is inherited from the weathered bedrock. Reaction is strongly acid or very strongly acid.

Ovid series

The Ovid series consists of deep, somewhat poorly drained soils on till plains in the northern part of the county. These soils formed in red glacial till deposits and reglaciated lacustrine sediments. Slope ranges from 0 to 8 percent.

The Ovid soils formed in the same kind of parent material as the associated moderately well drained and well drained Cazenovia soils. Also associated are the Ilion, Canandaigua, Appleton, Churchville, and Niagara soils. The Ovid soils are better drained than the loamy Ilion soils and the silty Canandaigua soils, have a higher clay content in the subsoil than the Appleton soils, do not have the clayey mantle of the Churchville soils, and have a higher gravel fragment content than the Niagara soils and are not as silty.

Typical pedon of Ovid silt loam, 3 to 8 percent slopes, in the town of Clarence, 150 feet north of Greiner Road and 0.2 mile west of the intersection of Greiner and Harris Hill Roads:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many roots; less than 5 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—10 to 12 inches; brown (7.5YR 5/4) light silty clay loam; few medium distinct light brownish gray (10YR 6/2) and many medium faint strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common roots; less than 5 percent coarse fragments; neutral; abrupt smooth boundary.

B2t—12 to 20 inches; dark brown (7.5YR 4/4) clay loam; common fine distinct yellowish red (5YR 5/6) and a few medium faint reddish gray (5YR 5/2) mottles; moderate medium subangular blocky structure; firm; few roots; dark brown (7.5YR 4/2) ped faces; clay films on ped faces and lining pores; 5 percent coarse fragments; neutral; clear wavy boundary.

C—20 to 60 inches; reddish brown (5YR 5/3) gravelly loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium platy structure; very firm; few roots in upper part; 20 percent coarse fragments less than 5 percent more than 3 inches in diameter; calcareous; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches and corresponds to the depth to carbonates. Bedrock is at a depth of more than 5 feet. Coarse fragments range from 0 to 15 percent in the A horizon, from 2 to 25 percent in the B horizon, and from 5 to 25 percent in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. Dry value is more than 5.5. Texture is mainly silt loam but includes loam and fine sandy loam. Structure is weak or moderate granular or subangular blocky. Reaction ranges from medium acid to slightly acid.

There is no B1 horizon in some pedons if the soil has been plowed deeply. If there is a B1 horizon, it is 7.5YR or 5YR in hue, ranges from 4 to 6 in value, and has chroma of 4. It is clay loam or silty clay loam or the gravelly analogs of those textures. In some pedons, it is silt loam. The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 4. Faces of peds have chroma of 1 or 2. Texture is clay loam or silty clay loam in the fine earth fraction with an average of 28 to 35 percent clay. Structure is moderate or strong, medium or coarse subangular blocky. Reaction ranges from medium acid to neutral. There are carbonates in the lower part of the solum in some profiles.

The C horizon above 40 inches is comparable in range of color to the B horizon. Texture of the fine earth fraction ranges from loam to silty clay loam. Structure is weak or moderate platy. Reaction is mildly alkaline or moderately alkaline.

Palms series

The Palms series consists of deep, very poorly drained soils in depressional areas of lake plains and till plains throughout the county. These soils formed in decomposed organic deposits underlain by loamy mineral soil material. The organic mantle is 16 to 50 inches thick. Slope ranges from 0 to 3 percent but is dominantly less than 1 percent.

The Palms soils are associated with the Edwards soils on similar landscapes but do not have the underlying marl layers of the Edwards soils. They are also associated with the Chenango, Blasdell, Lamson, and Canandaigua soils. The Palms soils have a much higher organic matter content than the Chenango and Blasdell soils on adjacent higher landscapes and are not nearly as well drained. The Palms soils have a thicker organic mantle than the Lamson soils that formed in sandy deposits. They do not have the high silt and clay content of the Canandaigua soils, which are often along the margin of the Palms soils.

Typical pedon of Palms muck, in the town of Concord, 30 yards west of Snyder Road and 0.4 mile north of the intersection of Synder Road and Sharp Street:

Oa1—0 to 12 inches; black (10YR 2/1) broken face and rubbed sapric material; weak fine and medium granular structure; very friable, slightly sticky; abundant roots; 5 to 8 percent fiber unrubbed and less than 5 percent rubbed; fibers are mainly herbaceous with a few woody fragments; less than 10 percent mineral silt particles; medium acid; clear smooth boundary.

Oa2—12 to 23 inches; black to very dark brown (10YR 2/1 to 2/2) broken face and rubbed sapric material; moderate coarse granular structure; friable (slightly sticky when wet); few fine roots; about 25 percent fiber unrubbed and less than 8 percent rubbed; fibers are about 15 percent herbaceous and 10 percent woody; less than 10 percent mineral silt particles; medium acid; clear smooth boundary.

Oa3—23 to 30 inches; very dark grayish brown (10YR 3/2) broken face and rubbed sapric material; massive; friable, slightly sticky; 30 percent fiber unrubbed and less than 15 percent rubbed, fibers are mainly herbaceous with very few woody fragments; less than 5 percent mineral content; slightly acid; clear smooth boundary.

Oa4—30 to 38 inches; dark grayish brown (10YR 4/2) broken face and rubbed sapric material; massive; friable, slightly sticky; 25 percent fiber unrubbed and less than 10 percent rubbed; fibers are herbaceous; less than 5 percent mineral content; slightly acid; abrupt smooth boundary.

IICg—38 to 50 inches; dark gray to gray (10YR 4/1 to 5/1) loam; massive; friable; 5 percent coarse fragments slightly acid.

The loamy mineral soil substratum is at a depth of 16 to 50 inches.

The surface tier, or Oa1 horizon, has hue of 10YR while the organic material in the subsurface and bottom tiers has hue of 5YR to 10YR. In all the organic tiers, value is 2 through 4; chroma is 0 through 2. The organic tiers have platy, blocky, or granular structure or they are massive. Consistence is very friable to firm. Reaction ranges from strongly acid to moderately alkaline.

The IICg horizon has hue of 10YR or 2.5Y, value or 4 to 6, and chroma of 1 or 2. Texture ranges from fine sandy loam to silty clay loam. Coarse fragments are 0 to 15 percent. This IICg horizon is slightly acid to moderately alkaline.

Palmyra series

The Palmyra series consists of deep, well drained soils on glacial outwash plains, associated kames, and kame terraces. These soils formed in glacial outwash deposits of dominantly gravel and sand. The gravel fragments are mainly limestone with varying proportions of sandstone, siltstone, and shale. Slope ranges from 0 to 40 percent but is dominantly 3 to 8 percent.

The Palmyra soils formed in the same kind of parent material as the associated, moderately well drained Phelps soils. They are also associated with the Halsey, Varysburg, Rhinebeck, and Arkport soils. The Palmyra soils are better drained than the Halsey soils; do not have the clayey substratum of the Varysburg soils; are better drained than the Rhinebeck soils and not as clayey; and have a higher gravel content than the Arkport soils.

Typical pedon of Palmyra gravelly loam, 3 to 8 percent slopes, in the town of Alden, about 800 feet north of New York Highway 33 and 50 feet east of Billow Road:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) gravelly loam, light brownish gray (10YR 6/2) dry and crushed; moderate medium granular structure; very friable, many very fine and fine roots; 20 percent coarse fragments; neutral; abrupt smooth boundary.

B&A—9 to 12 inches; brown (10YR 4/4) gravelly loam; weak medium subangular blocky structure; friable; common very fine roots; many fine pores; clay lining pores; thin fingers of pale brown (10YR 6/3) coatings surrounding peds; 20 percent coarse fragments; slightly acid, clear irregular boundary.

B21t—12 to 19 inches; brown (10YR 4/4) gravelly heavy loam; moderate coarse subangular blocky structure; friable, non-sticky; common very fine roots; many fine pores; clay lining pores; 25 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—19 to 28 inches; brown (10YR 4/3) gravelly light clay loam, moderate medium subangular blocky structure; firm, slightly sticky; common very fine pores and few fine pores; dark brown (10YR 3/3) clay films on vertical and some horizontal ped faces; 25 percent coarse fragments; slightly acid; abrupt irregular boundary.

IIC1—28 to 40 inches; grayish brown (10YR 5/2) very gravelly loamy sand, single grain; loose; 45 percent coarse fragments; mildly alkaline; abrupt wavy boundary.

IIIC2—40 to 60 inches; grayish brown (10YR 5/2) very gravelly sand, stratified; single grain; loose; 60 percent coarse fragments; calcareous; moderately alkaline.

The thickness of the solum ranges from 17 to 30 inches and corresponds to the depth to carbonates.

Coarse fragments, mainly gravel, range from 15 to 30 percent in the A horizon, 15 to 35 percent in the B horizon, and 40 to 70 percent in the C horizon. Bedrock is at a depth of more than 5 feet.

The Ap horizon has hue of 7.5YR or 10YR and value of 3 through 5. It is gravelly loam, gravelly silt loam, or gravelly sandy loam. Reaction ranges from medium acid to neutral.

The B horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. Texture is gravelly heavy fine sandy loam to gravelly clay loam. The Bt horizon tongues deeply into the C horizon. Reaction ranges from slightly acid to mildly alkaline.

The C horizon is stratified sand and gravel, very gravelly sand, or very gravelly loamy sand. The pebbles are of mixed origin and vary in proportion of limestone, sandstone, and shale. Reaction ranges from mildly alkaline to moderately alkaline.

Patchin series

The Patchin series consists of moderately deep, poorly drained and very poorly drained, nearly level soils on slightly concave parts of bedrock controlled till plains that receive surface runoff from adjacent soils. These soils formed in glacial till deposits underlain with shale bedrock. Bedrock is at a depth of 20 to 40 inches. Slope ranges from 0 to 3 percent.

The Patchin soils are associated with the Derb, Hornell, Orpark, Angola, and Lyons soils. The Patchin soils are shallower to shale bedrock than the Derb soils and not as well drained. They have less clay in the subsoil than the Hornell soils, are not as well drained as the Orpark soils, are more acid than the Angola soils, and are shallower to shale bedrock than the deep Lyons soils.

Typical pedon of Patchin silt loam, in the town of Aurora, 30 feet south of Bailey Road and 0.3 mile west of Lewis Road:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct reddish brown (5YR 4/3) mottles; moderate medium granular structure; very friable; many medium to very fine roots; many very fine pores; few, fine distinct black (5Y 2/1) concretions; strongly acid; abrupt smooth boundary.

A2g—10 to 14 inches; light brownish gray (2.5Y 6/2) silt loam; medium distinct strong brown (7.5YR 5/6) mottles; moderate thick platy structures; friable; few fine and very fine roots; few fine pores; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B2g—14 to 20 inches; dark grayish brown (10YR 4/2) light silty clay loam; many (45 percent) medium distinct strong brown (7.5YR 5/6) and common coarse distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse subangular blocky structure; firm; few fine and very fine roots; few fine pores, light brownish gray (2.5Y 6/2) silt coatings on vertical faces of peds; 10 percent coarse fragments; strongly acid; clear wavy boundary.

B3g—20 to 23 inches; grayish brown (2.5Y 5/2) shaly silt loam; many medium distinct strong brown (7.5YR 5/6) and many medium faint light brownish gray (2.5Y 6/2) mottles; weak coarse subangular blocky structure parting to moderate medium platy; firm; few fine pores; light brownish gray (2.5Y 6/2) silt coatings on vertical faces of peds; 20 percent soft shale fragments; strongly acid; abrupt smooth boundary.

R—23 inches, grayish brown (2.5Y 5/2) soft shale bedrock.

The thickness of the solum ranges from 20 to 36 inches. Depth to bedrock is 20 to 40 inches. Coarse fragments, dominantly shale, range from 0 to 10 percent throughout. Fragments more than 3 inches in diameter make up as much as 50 percent of the lower part of the subsoil or the substratum. In places thin subhorizons just above the bedrock contain up to 25 percent shale fragments. Reaction throughout is very strongly acid or strongly acid, unless the soil is limed.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 2 or 3. Texture is silt loam or light silty clay loam. The Ap horizon has weak or moderate, fine or medium granular or subangular blocky structure and very friable or friable consistence. The A2g horizon has hue of 2.5Y or 5Y, value of 6 or 7, and chroma of 2 or less. Texture is silt loam or light silty clay loam. Structure is weak or moderate thick to thin platy.

The Bg horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 2 or less. Mottles with chromas of more than 2 make up 40 to 60 percent of the matrix above a depth of 30 inches. Texture is silt loam or silty clay loam. Structure is weak or moderate, fine to coarse subangular blocky or prismatic parting to blocky. In some places the lower part has a platy structure which is inherited from the weathered bedrock.

There is a C or Cr horizon up to 6 inches thick in some pedons. Color range is the same as in the B horizon. Texture is shaly heavy silt loam to light silty clay loam. Platy structure is inherited from the weathered bedrock.

Phelps series

The Phelps series consists of deep, moderately well drained soils on glacial outwash plains and terraces. These soils formed in glacial outwash deposits having a high content of gravel and sand. The gravel component is dominated by limestone with varying proportions of sandstone, siltstone, and shale and with lesser amounts of igneous erratics. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Phelps soils formed in the same kind of parent material as the well drained Palmyra soils. The Phelps soils are associated with the Chenango, Alton, and Red Hook soils. They do not have the high gravel content that is in the Chenango and Alton soils. In addition, they are not as acid as the Chenango soils. The Phelps soils are better drained than the nearby somewaht poorly drained Red Hook soils.

Typical pedon of Phelps gravelly loam, 0 to 3 percent slopes, in the town of Newstead, 3,900 feet west of Millgrove Road and 1,300 feet south of abandoned barn on Hiller Road:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) gravelly loam, light brownish gray (10YR 6/2) dry; weak coarse subangular blocky structure parting to moderate fine granular; very friable; common fine and medium roots; 20 percent coarse fragments; neutral; abrupt smooth boundary.

B&A—10 to 15 inches; brown (10YR 4/3) gravelly heavy loam; weak medium subangular blocky structure; friable; common fine and medium roots; many medium pores; 20 percent coarse fragments; pale brown (10YR 6/3) and very pale brown (10YR 7/3) skeletons on ped faces about 1 millimeter thick; clay linings in some pores; neutral; clear wavy boundary.

B2t—15 to 28 inches; brown (10YR 4/3) gravelly heavy loam; common fine distinct yellowish brown (10YR 5/6) and common medium distinct light gray (10YR 7/2) mottles; moderate coarse subangular blocky structure; friable; few medium roots; common fine pores; thin dark brown (10YR 3/3) patchy clay films in pores and on ped faces; 20 percent coarse fragments; neutral; abrupt wavy boundary.

IIB3—28 to 32 inches; yellowish brown (10YR 5/4) gravelly sandy loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; very friable, few fine roots; many medium pores; 30 percent coarse fragments; neutral; clear wavy boundary.

IIC—32 to 50 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) very gravelly loamy sand with stratified layers of sand 2 to 3 inches thick; few to common, fine faint yellowish brown (10YR 5/4) mottles; single grain; loose; 45 percent coarse fragments; moderately alkaline.

The thickness of the solum ranges from 24 to 36 inches. Carbonates are at a depth of 18 to 40 inches, and bedrock is deeper than 5 feet. Gravel fragments are as much as 35 percent by volume in the A and B horizons and as much as 70 percent in the C horizon.

The Ap horizon has a value of 2 to 4 and chroma of 2 or 3. Texture ranges from gravelly sandy loam to gravelly silt loam, but gravelly loam is more common. Reaction ranges from medium acid to neutral. In some pedons, a thin gravelly loam or sandy loam A2 horizon is below the Ap horizon. If there is a A2 horizon, it has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2 or 3.

The B&A horizon is loam, silt loam, or clay loam or commonly the gravelly analogs of those textures. Material from the A2 horizon interfingers into the upper 4 inches of the B horizon as films 1 to 2 millimeters thick of clean sand grains on ped faces. The B2t horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 3 or 4. Mottles are mostly of higher chroma than the matrix, but some mottles have a chroma of 2 or less. The B2t horizon is loam, silt loam, or clay loam or the gravelly analogs of those textures. This horizon has weak to moderate, fine to coarse subangular blocky structure. Reaction ranges from medium acid to neutral. There is a thin B3 horizon in many pedons which ranges to sandy loam.

The IIC horizon has hue of 5YR through 10YR, value of 3 through 5, and chroma of 2 through 4. Texture ranges from very gravelly loamy sand to stratified sand and gravel. Reaction ranges from mildly alkaline to moderately alkaline.

Raynham series

The Raynham series consists of deep, somewhat poorly drained soils on low flats and in basins on the lowland lake plain. A few isolated areas are in depressions on the upland plateau. These soils formed in lake-laid deposits having a high content of silt and very fine sand. Slope ranges from 0 to 8 percent but is dominantly 0 to 3 percent.

The Raynham soils are associated with the Collamer, Williamson, Cosad, Swormville, Lamson, and Canandaigua soils. The Raynham soils are coarser textured than the Collamer soils, are not as well drained as the Williamson soils, do not have the sandy mantle that is in the Cosad soils, and do not have the fine textured surficial mantle associated with the Swormville soils. The Raynham soils are slightly better drained than the Lamson and Canandaigua soils, are not as sandy as the Lamson soils, and have a lower clay content than the Canandaigua soils.

Typical pedon of Raynham silt loam, 0 to 3 percent slopes, in the town of Amherst, 1 mile west of Cambell Blvd. and 1,000 feet south of Tonawanda Creek Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many roots; slightly acid; abrupt smooth boundary.

B2—8 to 26 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2), and common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate coarse subangular blocky structure parting to moderate medium platy; friable; common roots; grayish brown (10YR 5/2) ped faces; slightly acid; clear wavy boundary.

C1—26 to 42 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct light gray (N 7/0) and many coarse distinct brownish yellow (10YR 6/8) mottles; massive; friable; many small shells; thin stratified fine sand layers; mildly alkaline; clear wavy boundary.

IIC2—42 to 60 inches; grayish brown (10YR 5/2) fine sand; common coarse distinct strong brown (7.5YR 5/6) mottles; single grain; loose; thin stratified silty layers; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 16 to 37 inches. Depth to carbonates ranges from 20 inches to many feet. Coarse fragments are less than 2 percent by volume throughout the soil. Bedrock is at a depth of more than 5 feet and generally is at a depth of more than 10 feet.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. It is silt loam or very fine sandy loam. This horizon has fine or medium granular structure and is very friable or friable. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 7.5YR to 2.5Y, value of 4 through 6, and chroma of 2 to 4. Where the matrix of the B2 horizon has chroma of more than 2, there are ped faces with chroma of 2. Texture is silt loam, silt, or very fine sandy loam. Consistence is friable or firm. Structure is weak to moderate, fine to coarse subangular blocky, or it is medium to thick platy. Reaction ranges from strongly acid to neutral.

The C horizon has hue of 7.5YR to 5Y, value of 4 to 6, and chroma 1 through 4. Texture ranges from fine sand to silt loam. The material in the C horizon is massive or varved. Reaction is medium acid to moderately alkaline.

In the survey area, these soils are taxadjuncts to the Raynham series because they are shallow to free carbonates and have fine sand in the substratum. However, these differences do not significantly affect the use and management of these soils.

Red Hook series

The Red Hook series consists of deep, somewhat poorly drained soils on glacial outwash plains and stream terraces throughout the county. Those soils formed in outwash and stream deposits. Slope ranges from 0 to 3 percent.

The Red Hook and the associated Blasdell, Castile, Chenango, and Farnham soils formed in similar water-sorted deposits, but the Red Hook soils are wetter than these associated soils. The Red Hook soils are also associated with the Rhinebeck, Halsey, and Middlebury soils. They are of a coarser texture than the Rhinebeck soils, are not as poorly drained as the Halsey soils, and are not subject to common flooding like the Middlebury soils.

Typical pedon of Red Hook silt loam, in the town of Hamburg, 210 feet from east edge of woods and 590 feet north of Lakeview Road:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; less than 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—10 to 17 inches; yellowish brown (10YR 5/4) loam; common coarse faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; grayish brown (2.5Y 5/2) ped faces; 5 percent coarse fragments; neutral; clear wavy boundary.

B22—17 to 23 inches; brown (10YR 5/3) heavy loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; few fine roots; grayish brown (2.5Y 5/2) ped faces; 10 percent coarse fragments; mildly alkaline; abrupt wavy boundary.

IICl—23 to 45 inches; dark gray (5Y 4/1) shaly loam; common fine distinct dark yellowish brown (10YR 4/4) mottles, increasing in abundance with depth; massive; firm; 30 percent coarse fragments; weakly calcareous; mildly alkaline; clear wavy boundary.

IIIC2—45 to 60 inches; gray (10YR 5/1) stratified shaly sandy loam; firm; 20 percent coarse fragments; calcareous; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. Bedrock is at a depth of 5 feet or more. The average clay content between depths of 10 and 40 inches is less than 18 percent, but an individual horizon within these depths may contain up to 30 percent clay. Coarse fragments are 3 to 15 percent by volume in the A horizon and 10 to 60 percent in the subsoil and substratum, but they average less than 35 percent to a depth of 40 inches.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 1 to 3. Texture ranges from fine sandy loam to silt loam, but silt loam is more common. Structure is weak or moderate, fine to coarse granular or subangular blocky, and consistence is very friable or friable. Reaction ranges from strongly acid to slightly acid.

The B2 horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 1 to 4. Chroma is 1 or 2 in the matrix or on ped faces in at least some subhorizon within 20 inches of the soil surface. The B2 horizon is sandy loam, loam or silt loam or, commonly, the gravelly or very gravelly analogs of those textures. It has very weak to moderate subangular blocky or platy structure and very friable to firm consistence. Reaction ranges from medium acid to mildly alkaline.

The C horizon has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 1 to 3. Texture ranges from sandy loam to silt loam in the fine earth fraction. This horizon is massive or single grain. Reaction ranges from slightly acid to moderately alkaline.

In the survey area these soils are taxadjuncts to the Red Hook series because they are shallower to carbonates and slightly higher in reaction throughout the soil than is defined as the range for the series. This difference, however, does not significantly affect the use and management of the soils.

Remsen series

The Remsen series consists of deep, somewhat poorly drained soils on till plains in the northern and western parts of the county. These soils formed in clayey glacial till deposits. Slope ranges from 0 to 15 percent but is dominantly 0 to 8 percent.

The Remsen soils are associated with the Darien, Derb, Erie, Brockport, and Canadice soils. The Remsen soils have a higher clay content than the Darien soils, are more clayey and less acid than the Derb soils, do not have the fragipan of the coarser textured Erie soils, are deeper to bedrock than the Brockport soils, and are the better drained than the Canadice soils.

Typical pedon of Remsen silty clay loam, 3 to 8 percent slopes, in the town of Alden, 1 mile south of the village of Alden, near New York Highway 239:

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

A2—7 to 9 inches; grayish brown (2.5Y 5/2) silty clay loam, light olive brown (2.5Y 5/4) crushed; many medium and fine distinct light olive brown (2.5Y 5/6) and yellowish brown (10YR 5/4) mottles; moderate medium blocky structure; slightly firm, sticky and plastic; common roots; slightly acid; wavy boundary.

B21t—9 to 12 inches; dark grayish brown (2.5Y 4/2) silty clay; many fine and medium distinct dark yellowish brown (10YR 4/4) and olive brown (2.5Y 4/4) mottles in ped interiors; strong medium blocky structure within strong coarse prisms; firm, plastic and sticky; roots penetrate peds; fine clay lined pores; grayish brown (2.5Y 5/2) coatings like A2 horizon material on some vertical faces; distinct dark grayish brown (2.5Y 4/2) clay coatings on many horizonal faces; 5 percent fine shale fragments; slightly acid; clear wavy boundary.

B22t—12 to 20 inches; dark grayish brown (2.5Y 4/2) silty clay; common medium and fine faint olive brown (2.5Y 4/4) to yellowish brown (10YR 5/4) mottles in ped interiors; moderate to weak coarse prismatic structure parting to moderate medium blocky; firm, very plastic and sticky; few roots; common very fine clay lined pores; discontinuous but distinct clay coatings of dark grayish brown (2.5Y 4/2) to dark gray (2.5Y 4/1) on vertical and horizontal ped faces; 5 percent fine shale fragments; slightly acid; diffuse boundary.

B23t—20 to 30 inches; dark grayish brown (2.5Y 4/2) clay; common medium and fine faint olive brown (2.5Y 4/4) mottles and common dark gray (5Y 4/1) lines in ped interiors; moderate, medium and coarse blocky structure; firm, very plastic and sticky; some fine pores having dark gray (5Y 4/1) clay linings; discontinuous dark grayish brown (2.5Y 4/2) to dark gray (5Y 4/1) clay films on vertical and horizontal ped faces; 10 percent fine shale fragments; neutral; clear wavy boundary.

B3—30 to 36 inches; dark grayish brown (2.5Y 4/2) clay, common faint olive brown (2.5Y 4/4) mottles and streaks of dark gray (5Y 4/1) in ped interiors; moderate coarse blocky structure; firm, very plastic and sticky; dark gray (5Y 4/1) clay films and patches of light brownish gray (10YR 6/2) carbonates on ped faces; few light brownish gray to gray (10YR 6/2, 5/2) soft carbonate nodules; 10 percent soft fine and medium shale fragments; weakly calcareous; mildly alkaline; gradual wavy boundary.

C—36 to 60 inches; dark grayish brown (2.5Y 4/2) clay; common medium faint mottles of slighlty higher chroma and many fine discontinuous threadlike mottles of dark gray (5Y 4/1) to gray (5Y 5/1); massive; weak tendency towards horizontal cleavage in shale fragments; common fine pores having gray (5Y 5/1) linings; 10 percent fine shale fragments; strongly calcareous; moderately alkaline.

The thickness of the solum ranges from 20 to 28 inches and corresponds to the depth to carbonates. Depth to shale bedrock is 5 feet or more. Coarse fragments, mainly shale, range from 0 to 10 percent in the A and B horizons and up to 30 percent in the C horizon. In at least one subhorizon between the base of the Ap horizon and 30 inches, more than 40 percent of the matrix or mottles are higher than 2 in chroma.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. Dry value is higher than 5.5. Texture is silty clay loam or silt loam. Structure is weak or moderate granular or subangular blocky. Reaction ranges from strongly acid to slightly acid. The A2 horizon has hue of 10YR to 5Y, value of 3 to 5 and chroma of 2 to 4. Texture is silty clay loam or silt loam. Structure is weak or moderate platy or fine and medium subangular blocky. Consistence is friable or firm. There may be no A2 horizon. Reaction ranges from strongly acid to slightly acid.

The B2t horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay or clay. Structure is moderate to strong, medium and coarse angular or subangular blocky, that may have parted from weak to strong coarse prismatic. Reaction ranges from medium acid to mildly alkaline. The B3 horizon is similar in color and texture to the B2t horizon. Structure is weak and moderate angular blocky, subangular blocky, or platy that has parted from weak or moderate prismatic.

The C horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2. It is clay or silty clay or commonly the shaly analogs of those textures. This horizon has thin to thick platy structure, or it is massive. Reaction ranges from mildly alkaline to moderately alkaline.

Rhinebeck series

The Rhinebeck series consists of deep, somewhat poorly drained soils that occur extensively throughout the county on the lowland lake-plain and in nearly level to sloping areas in valleys. These soils formed in lake laid sediments dominated by silt and clay. In some areas, they are thinly mantled with gravelly outwash deposits. Slope ranges from 0 to 15 percent but is more commonly 0 to 3 percent.

The Rhinebeck soils formed in the same kind of parent material as the associated poorly drained Canadice soils and the moderately well drained Hudson soils. They are associated with the Niagara, Odessa, Churchville, Darien, and Remson soils. The Rhinebeck soils have a higher clay content than the Niagara soils, are not as red as the Odessa soils, do not contain the shale fragments of the Darien and Remson soils, and are not underlain by glacial till deposits like the Churchville soils.

Typical pedon of Rhinebeck silt loam, 3 to 8 percent slopes, in the town of Concord, 0.5 mile west of U.S. Highway 219 and 250 feet south of the intersection of Sharp Road and U.S. Highway 219:

Ap—0 to 9 inches; dark grayish brown (2.5Y 4/2) silt loam; moderate medium granular structure; friable; many fine and few medium roots; pale olive (5Y 6/3) ped faces; slightly acid; abrupt smooth boundary.

B1—9 to 16 inches; light yellowish brown (2.5Y 6/4) silty clay; many common distinct brownish yellow (10YR 6/8) mottles; strong coarse subangular blocky structure; firm; common fine roots; light gray (5Y 7/2) ped faces; strongly acid; clear wavy boundary.

B2t—16 to 37 inches; brown (10YR 5/3) silty clay; common fine distinct yellowish brown (10YR 5/6) and common fine faint gray (10YR 5/1) mottles; strong coarse prismatic structure parting to strong coarse angular blocky; very firm, slightly sticky and plastic; common fine roots along prism faces; gray (5Y 6/1) ped faces with silt coatings and discontinuous clay films; clay lining pores; neutral; gradual wavy boundary.

C1—37 to 64 inches; dark grayish brown (2.5Y 4/2) silty clay; few fine faint light olive brown (2.5Y 5/6) mottles; moderate very coarse prismatic structure; very firm, slightly sticky and plastic; gray (5Y 5/1) ped faces; few very fine and fine roots along ped faces, varving in interior of peds; evidence of carbonate concretions; 5 percent coarse fragments; mildly alkaline; gradual wavy boundary.

C2—64 to 70 inches; dark grayish brown (2.5Y 4/2) varved silty clay; massive; very firm, plastic and slightly sticky; 5 percent coarse fragments; calcareous; moderately alkaline.

The thickness of the solum ranges from 20 to 48 inches and corresponds to the depth of carbonates. Coarse fragments range from 0 to 25 percent in the A horizon and from 0 to 10 percent in the B and C horizons. Bedrock is at a depth of more than 6 feet.

The Ap horizon ranges in hue from 10YR to 2.5Y, and in chroma from 3 to 6. Value of the surface horizon is 2 to 4 when moist and is more than 5.5 when dry. Texture is silt loam, silty clay loam, or gravelly loam. Structure is granular or subangular blocky, and consistence is very friable or friable. Reaction ranges from strongly acid to neutral.

The B1 horizon has hue of 7.5YR to 5Y, value of 5 or 6, and chroma of 3 to 6. It is mottled. Texture ranges from a silty clay loam to silty clay. Structure is moderate or strong subangular blocky. Consistence is friable or firm. Reaction ranges from strongly acid to mildly alkaline. An A2 horizon replaces or overlies the B1 horizon in some profiles. It is similar to the B1 horizon in hue and value but has chroma of 2 or 3. The B2t horizon has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 2 to 4, and it is mottled. Chroma of the ped faces are 1 or 2. Texture is silty clay loam or silty clay. Structure ranges from weak to strong prismatic to subangular or angular blocky. Consistence is firm or very firm. Reaction ranges from strongly acid to mildly alkaline. A B3 or IIB3 horizon underlies the B2t horizon in some profiles. It is similar in color and texture to the B2t horizon. Structure is generally of weaker grade, or it is platy and inherited from the varved lake sediments. Consistence is firm or very firm.

The C horizon ranges in hue from 7.5YR to 5Y, in value from 3 to 5, and in chroma from 1 to 3. The C horizon is mainly silty clay loam, clay, or silty clay, and it can contain thin strata of fine sand. It is massive, has platy structure inherited from the varved sediment, or is prismatic. In some places, where glacial till deposits are in the lower part of the C horizon, texture ranges from shaly loam to stratified shaly loamy sand.

Schoharie series

The Schoharie series consists of deep, well drained and moderately well drained soils on convex knolls and ridges and on dissected landforms in the northern part of the lowland lake plain. These soils formed in reddish glacial lake sediments having a high clay content. Slope ranges from 0 to 15 percent but is dominantly 3 to 8 percent.

The Schoharie soils formed in the same kind of parent material as the somewhat poorly drained Odessa soils and the poorly drained and very poorly drained Lakemont soils. They are associated with the Churchville, Cayuga, and Niagara soils. The Schoharie soils are better drained than the Churchville soils, do not have the underlying glacial till deposits of the Churchville and Cayuga soils, and are better drained than the silty Niagara soils.

Typical pedon of Schoharie silt loam, 3 to 8 percent slopes, in the town of Lancaster, 0.3 mile east of Ranson Road along old D.L.&W Railroad grade:

Ap—0 to 9 inches; dark brown (7.5YR 4/2) silt loam; moderate fine and medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—9 to 13 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm, slightly plastic; common fine roots; commmon fine pores; light brown (7.5YR 6/4) light silty clay loam interfingering around few peds; few clay films lining pores of the peds interiors; slightly acid; gradual irregular boundary.

B22—13 to 20 inches; reddish brown (5YR 5/4) silty clay; weak medium and coarse prismatic structure parting to moderate fine and medium angular blocky; firm, plastic; few fine roots; common fine pores; common distinct reddish brown (5YR 5/3) clay films on vertical and horizontal ped faces, clay films lining all pores; neutral; clear wavy boundary.

B23—20 to 31 inches; reddish brown (5YR 4/4) silty clay; common fine faint reddish brown (5YR 5/4) mottles; moderate medium and coarse prismatic structure parting to strong fine and medium angular blocky; firm, plastic; few fine roots; few fine pores; common distinct reddish brown (5YR 4/3) clay films on ped faces and lining all pores; mildly alkaline; clear wavy boundary.

C1—31 to 50 inches; reddish brown (5YR 4/3) silty clay with thin varves of silt; weak very coarse prismatic structure parting to moderate thick and very thick platy; firm, plastic; streaks of pinkish gray (5YR 6/2) lime segregated on ped faces; weakly calcareous; mildly alkaline; clear wavy boundary.

C2—50 to 60 inches; reddish brown (5YR 4/3) clay varved with silt; weak thick and very thick platy structure; firm, plastic; strongly calcareous; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches and depth to carbonates is the same. Bedrock is at a depth of more than 5 feet. There are usually no coarse fragments, but there can be up to 5 percent in some horizons.

The Ap horizon has hue of 7.5YR or 10YR and chroma of 2 or 3. Value is 3 or 4 when moist and more than 5.5 when dry. Where there is an A2 horizon, it has hue of 5YR to 7.5YR, value of 5 or 6, and chroma of 3 or 4, and it often has high-chroma mottles. Texture is silt loam or silty clay loam and, occasionally, loam. Structure is fine or medium granular or subangular blocky. Reaction ranges from medium acid to neutral.

Where there is a B&A horizon, color, texture, and structure are similar to those of the B2t and A2 horizons.

The B2t horizon has hue of 2.5YR or 5YR and chroma of 3 or 4 with subhorizons ranging to hue of 7.5YR. The lower part of the B2t horizon normally has faint or distinct mottles, but no mottles that have a chroma of 2 or less occur in the upper 10 inches of this horizon. It is silty clay loam to clay with an average clay content of 35 to 55 percent. Reaction ranges from medium acid to mildly alkaline.

The C horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 through 4. It is silty clay or clay and is often varved with silt. Reaction is mildly alkaline or moderately alkaline.

Schuyler series

The Schuyler series consists of deep, moderately well drained soils on valley sides and side slopes in the upland plateau. These soils formed in shaly glacial till deposits that are underlain by shale bedrock at a depth of 40 to 60 inches. Slope ranges from 15 to 40 percent but is dominantly 15 to 25 percent.

The Schuyler soils formed in the same kind of parent material as the associated somewhat poorly drained Derb soils. They are also associated with the Orpark, Hornell, and Marilla soils. The Schuyler soils are better drained and deeper to bedrock than the Orpark soils, do not have the high clay content that is in the Hornell soils, and do not have the fragipan layer that is in the Marilla soils.

Typical pedon of Schuyler silt loam, 15 to 25 percent slopes, in the town of Aurora, 54 feet west of Park Road, and 0.3 mile northeast of the entrance of Emery Park:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; very friable; many fine medium roots; 5 percent coarse fragments; very strongly acid; abrupt wavy boundary.

B21—6 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common coarse to many fine and medium roots; 10 percent coarse fragments; very strong acid; clear wavy boundary.

B22—15 to 22 inches; yellowish brown (10YR 5/4) heavy silt loam; moderate medium subangular blocky structure; friable; many fine to very fine and common medium roots; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B23—22 to 32 inches; light olive brown (2.5Y 5/4) shaly silt loam; few fine faint light brownish gray (2.5Y 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; pale olive (5Y 6/3) ped faces; common fine roots; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B3—32 to 42 inches; olive (5Y 4/3) shaly heavy silt loam; common fine distinct light olive gray (5Y 6/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; light olive gray (5Y 6/2) ped faces; few very fine roots; 40 percent coarse fragments; very strongly acid; abrupt wavy boundary.

Cr—42 to 48 inches, olive (5Y 4/3) very shaly heavy silt loam interbedded with layers of light olive gray (5Y 6/2) and strong brown (7.5YR 5/6) shale; massive; very firm; very strongly acid; clear smooth boundary.

R—48 inches; olive (5Y 4/3) soft shale bedrock.

The thickness of the solum ranges from 20 to 45 inches. Depth to bedrock is 40 to 60 inches. Coarse fragments, mainly shale, range from 5 to 15 percent in the A horizon, 5 to 45 percent in the B horizon, and 20 to 70 percent in the C horizon. Flagstones range from 0 to 10 percent in any horizon.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 2 or 3. Texture is silt loam, loam, fine sandy loam. Structure is weak to moderate fine or medium granular or subangular blocky. Consistence is very friable or friable. Reaction ranges from extremely acid to medium acid, unless the soil is limed.

The B2 horizon has hue of 7.5YR through 5Y, value of 4 through 6, and chroma of 3 through 5. Both low- and high- chroma mottles are at a depth of less than 24 inches. Texture is loam, silt loam, or light silty clay loam in the fine earth fraction. Structure is weak to moderate, fine to coarse subangular blocky or granular. Consistence ranges from very friable to firm. Reaction ranges from medium acid to extremely acid. The B2 horizon has weaker structure and a high coarse fragment content than the B3 horizon and has chroma as low as 2.

The C or Cr horizon has hue of 10YR through 5Y, value of 4 or 5 and chroma of 1 through 3. It is silt loam, loam, or silty clay loam with shaly or very shaly analogs of those textures. Reaction ranges from extremely acid to medium acid.

The R horizon is mainly shale bedrock, but some areas include siltstone.

Scio series

The Scio series consists of deep, moderately well drained soils on terraces or old alluvial fans. These soils formed in wind- or water-deposited silt and very fine sand. Slope ranges from 0 to 3 percent.

The Scio soils are associated with the Allard, Williamson, Raynham, Collamer, and Arkport soils. The Scio soils are not as well drained as the Allard and Arkport soils, but are better drained than the Raynham soils. They do not have the fragipan layer of the Williamson soils, or the high clay content of the Collamer soils, and they have a lower sand content than the Arkport soils.

Typical pedon of Scio silt loam, in the town of Evans, 1,000 feet north of Caine Road, alongside Big Sister Creek:

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21—10 to 20 inches; yellowish brown (10YR 5/4) silt loam; moderate subangular blocky structure; very friable; common fine roots; common medium and fine pores; strongly acid; gradual wavy boundary.

B22—20 to 25 inches; dark yellowish brown (10YR 4/4) silt loam; few medium faint light brownish gray (7.5YR 6/2) and fine medium distinct strong brown (7.5YR 5/8) mottles; moderate coarse subangular blocky structure; friable; few fine roots; common medium and fine pores; medium acid; clear wavy boundary.

B23—25 to 34 inches; brown (10YR 5/3) silt loam; common medium distinct strong brown (7.5YR 5/6), common fine prominent strong brown (7.5YR 5/8), and many coarse distinct light brownish gray (2.5YR 6/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; common medium and fine pores; strongly acid; abrupt smooth boundary.

C1—34 to 42 inches; brown (10YR 5/3) silt loam; common medium distinct dark brown (7.5YR 4/4), few fine prominent strong brown (7.5YR 5/8), and common medium distinct light gray (2.5YR 7/2) mottles; weak thick platy structure; friable; common medium and fine pores; strongly acid; abrupt smooth boundary.

IIC2—42 to 48 inches; brown (10YR 5/3) gravelly sandy loam; common medium distinct strong brown (7.5YR 5/6), common fine prominent strong brown (7.5YR 5/8), and common medium distinct grayish brown (2.5YR 5/2) mottles; massive; loose; 40 percent coarse fragments; medium acid; abrupt smooth boundary.

IIIC3—48 to 60 inches; dark brown (10YR 4/3) gravelly loamy sand; common fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; 40 percent coarse fragments; massive; strongly acid.

The thickness of the solum ranges from 24 to 36 inches. Contrasting texture is at a depth of 40 inches to 6 feet. Bedrock is at a depth of 6 feet or more. Coarse fragments range from 0 to 5 percent above 40 inches and up to 60 percent below 40 inches.

The Ap horizon has hue of 10YR, value of 3 to 5, 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 through 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 7.5YR through 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture ranges from silt loam to stratified gravel and sand. This horizon has weak platy structure or is massive or single grain. Consistence ranges from loose to firm. Reaction ranges from strongly acid to mildly alkaline.

Swormville series

The Swormville series consists of deep, somewhat poorly drained soils on the lowland plain, chiefly in the extreme northern part of the county. These soils formed in lacustrine or old alluvial deposits high in clay content and underlain with sandy lake-laid sediments. Slope ranges from 0 to 3 percent.

The Swormville soils formed in the same kind of material as the associated poorly drained and very poorly drained Getzville soils. They are also associated with the Raynham, Minoa, Niagara, Lamson, and Wayland soils. The Swormville soils have a higher clay content in the surficial mantle than the Raynham soils, are not as sandy in the upper mantle as the Minoa soils, do not have the high silt content of the Niagara soils, are somewhat better drained than the Lamson soils, and are not subject to flooding as are the silty Wayland soils.

Typical pedon of Swormville clay loam, in the town of Newstead, 0.4 mile west of Greenbush Road, 50 feet south of Tonawanda Creek Road, and 30 feet west of hedgerow:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) clay loam; moderate fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B21t—8 to 13 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct light brownish gray (2.5Y 6/2) and many medium faint strong brown (7.5YR 5/8) mottles; moderate medium blocky structure; firm, plastic and slightly sticky; common roots; grayish brown (2.5Y 5/2) ped faces; clay films on ped faces and in pores; medium acid; clear wavy boundary.

B22t—13 to 20 inches; yellowish brown (10YR 5/4) loam; common fine distinct gray (10YR 6/1) and many medium distinct strong brown (7.5YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium blocky; firm, plastic and slightly sticky; common roots; grayish brown (2.5Y 5/2) ped faces; clay films on ped faces and in pores; slightly acid; abrupt smooth boundary.

IIB3—20 to 26 inches; light yellowish brown (10YR 6/4) loamy fine sand; common coarse distinct light gray (10YR 7/2), many medium distinct strong brown (7.5YR 5/6), and few fine distinct yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very friable; few roots; slightly acid; abrupt smooth boundary.

IIC—26 to 60 inches; gray (10YR 5/1) sand; few coarse faint yellowish brown (10YR 5/4) mottles; single grain; loose; neutral; weak effervescence.

Depth to the underlying sandy material ranges from 20 to 40 inches. The thickness of the solum ranges from 25 to 45 inches. Depth to carbonates ranges from 20 to 70 inches. Coarse fragments range from 0 to 5 percent in the surface layer and the upper part of the subsoil and from 0 to 35 percent in the contrasting sandy horizons.

The Ap and A1 horizons have hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 2 or 3. Texture ranges from loam to silty clay loam. The Ap and A1 horizons have weak or moderate, fine or medium granular or subangular blocky structure and friable to very friable consistence. Reaction ranges from strongly acid to neutral.

The Bt horizon has hue of 7.5YR through 5Y, value of 3 through 6, and chroma of 2 through 4. It has mottles. Chroma of 2 or less is dominant on the ped faces; however, chroma is 2 in less than 60 percent by volume of the ped interiors of at least one subhorizon above a depth of 30 inches. Texture ranges from loam to silty clay loam. Structure ranges from weak to strong prismatic, subangular, or angular blocky. Consistence is firm or very firm. Reaction ranges from medium acid to neutral.

A thin IIB3 or IIB23t horizon underlies the Bt horizon and has similar colors and mottles. Structure is generally of weaker grade. Texture of the fine earth fraction ranges from loamy fine sand to very fine sandy loam. Consistence is friable or loose. There are free carbonates in some pedons. Reaction ranges from slightly acid to mildly alkaline.

The IIC horizon has hue of 5YR through 5Y, value of 3 through 5, and chroma of 1 through 4. Texture of the fine earth fraction ranges from loamy fine sand to sand. Reaction ranges from neutral to moderately alkaline.

Teel series

The Teel series consists of deep, moderately well drained to somewhat poorly drained soils on flood plains along major streams and on alluvial fans. These soils formed in silty alluvium predominantly from areas of limestone and shale. Slopes ranges from 0 to 3 percent.

The Teel soils formed in the same kind of parent material as the associated well drained Hamlin soils. They are also associated with the Middlebury, Tioga, and Wayland soils. The Teel soils are more silty than the Middlebury and Tioga soils. They do not have the sand and gravel of the Middlebury soils or the clay content of the Wayland soils. They are not as well drained as the Tioga soils and are better drained than the Wayland soils.

Typical pedon of Teel silt loam, in the town of Cheektowaga, 2.5 miles northeast of Gardenville, just north of William Street:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light grayish brown (10YR 6/2) dry; moderate medium granular structure; friable; many roots; slightly acid; abrupt smooth boundary.

B21—9 to 17 inches; dark grayish brown (10YR 4/2) silt loam; weak fine and medium subangular blocky structure; friable; common fine roots; many fine and medium pores; slightly acid; clear smooth boundary.

B22—17 to 26 inches; brown to dark brown (10YR 4/3) silt loam; common medium faint grayish brown (10YR 5/2) mottles; weak fine prismatic structure; friable; few medium roots; common pores; neutral; clear smooth boundary.

B23—26 to 48 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; very weak medium prismatic structure; friable; common fine pores; neutral; clear smooth boundary.

C—48 to 60 inches; dark gray (10YR 4/1) very fine sandy loam varved with silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive with some stratification; friable; neutral.

The thickness of the solum ranges from 24 to 50 inches. Carbonates are at a depth of more than 40 inches. Bedrock is at a depth of more than 5 feet. Coarse fragments are generally less than 5 percent by volume in the A and B horizon, but they range to 20 percent in the C horizon.

The Ap horizon has hue of 7.5YR to 10YR, value of 3 or 4, and chroma of 1 to 3. Texture is silt loam or very fine sandy loam. The Ap horizon has weak or moderate, fine or medium granular structure. Consistence is very friable or friable. Reaction ranges from strongly acid to neutral.

The B2 horizon has hue of 5YR to 2.5Y and value of 3 to 5. It is mottled, and mottles with chroma of 2 or less are within 12 to 24 inches of the surface. Texture is silt loam or very fine sandy loam. The B2 horizon has weak or moderate, fine to coarse, subangular blocky or prismatic structure and friable or very friable consistence. Reaction ranges from strongly acid to mildly alkaline.

The C horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 1 to 4. It has few to many mottles. The C horizon is silt loam, very fine sandy loam, or fine sandy loam and, commonly, the gravelly analogs of those textures. Structure is platy from fine stratification, or it is massive. Consistence is very friable to firm. Reaction ranges from medium acid to mildly alkaline.

Tioga series

The Tioga series consists of deep, well drained soils on flood plains along major streams and creeks, particularly in the southern part of the county. These soils formed in alluvium derived mainly from sandstone, siltstone, and shale. Slope ranges from 0 to 3 percent.

The Tioga soils are in a drainage sequence with the moderately well drained to somewhat poorly drained Middlebury soils that formed in similar parent materials. The Tioga soils have a lower silt content than the similar well drained Hamlin soils and the moderately well drained to somewhat poorly drained Teel soils on flood plains. They are associated with the Chenango soils on nearby terraces but do not have the high gravel content.

Typical pedon of Tioga silt loam, in the town of Boston, about 100 feet north of intersection of Zimmerman and Back Creek Roads:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; friable; many very fine and fine roots; few medium and coarse tubular pores (primarily worm channels); medium acid; abrupt smooth boundary.

B21—10 to 35 inches; dark yellowish brown (10YR 4/4) silt loam; common fine distinct strong brown (7.5YR 5/6) mottles in the lower part; moderate medium subangular blocky structure; friable; very few very fine roots; brown (10YR 4/3) ped faces; very dark grayish brown worm casts; medium, fine, and coarse tubular pores; medium acid; gradual wavy boundary.

B22—35 to 43 inches; dark yellowish brown (10YR 4/4) silt loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; very few very fine roots; brown to dark brown (10YR 4/3) ped faces; very dark grayish brown (10YR 3/2) worm casts; few medium and coarse tubular pores; medium acid; clear wavy boundary.

IIB3—43 to 51 inches; dark yellowish brown (10YR 4/4) sandy loam; few fine distinct yellowish red (5YR 5/6), and few fine faint very dark gray (10YR 3/1) mottles; weak medium subangular blocky structure; friable, very few very fine roots; brown to dark brown (10YR 4/3) ped faces; dark brown (10YR 3/3) worm casts; few medium and coarse tubular pores; 3 percent fine gravel; medium acid; gradual wavy boundary.

IIC—51 to 60 inches; dark yellowish brown (10YR 4/4) sandy loam; few fine distinct yellowish red (5YR 5/6), few fine distinct strong brown (7.5YR 5/6), and few fine faint dark grayish brown (10YR 4/2) mottles; massive in individual strata 2 to 6 inches thick that range in texture from sandy loam to loamy sand; friable, dark brown (10YR 3/3) worm casts; few coarse tubular pores; 5 percent fine gravel; medium acid.

The thickness of the solum ranges from 18 to 55 inches. There are generally no coarse fragments in the A horizon. Coarse fragments, mainly gravel, range from 0 to 35 percent in the B horizon and up to 60 percent below a depth of 40 inches in the C horizon.

The Ap horizon has hue of 10YR to 2.5Y, value of 3 to 5, and chroma of 2 or 3. Dry value is 6 or higher. Texture is mainly silt loam but also includes fine sandy loam or loam. Reaction ranges from strongly acid to neutral.

The B horizon has hue of 2.5Y to 7.5YR, value of 4 or 5, and chroma of 2 to 4. This horizon does not have mottles to a depth of 24 inches. Texture is silt loam, fine sandy loam, or loam, and, occasionally, it is gravelly. Structure is subangular blocky or granular. Consistence is very friable or friable. Reaction is strongly acid to neutral. There is a IIB3 horizon in some profiles.

The IIC horizon ranges from silt loam to loamy sand and is often gravelly or very gravelly. It is commonly stratified below 40 inches. Consistence is loose to friable. Reaction ranges from medium acid to mildly alkaline.

In this survey area, these soils are taxadjuncts to the Tioga series because they have a thicker solum and a more acid reaction in the lower part of the subsoil than is typical for the Tioga soils. However, this difference does not affect the use and management of the soils.

Udifluvents

Udifluvents consist of deep, moderately well drained and well drained soils adjacent to streams that are subject to frequent flooding. These soils formed in recent alluvial deposits and have little or no soil profile development.

The Udifluvents occur in an undifferentiated group with Fluvaquents. They often are near the Hamlin, Tioga, Middlebury, Teel, and Wayland soils. Udifluvents are that part of the flood plain where the adjacent stream—through scour, cutting, and lateral erosion—commonly shifts the soil deposits from place to place.

Udifluvents are too variable for a typical pedon to be described. In some representative pedons, the surface layer is 1 to 9 inches thick. Depth to bedrock is usually more than 4 feet. Coarse fragments, including gravel, shale, cobblestones, and flagstones, range from 0 to 80 percent by volume. These soils are very strongly acid to mildly alkaline. Organic matter content decreases irregularly with depth.

The surface layer has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 2 or 3. This layer is quite variable ranging from fine sand to silty clay loam or the shaly, gravelly, cobbly, or very gravelly analogs of those textures.

The substratum has hue of 5YR to 2.5Y, value of 3 to 7, and chroma of 2 to 6. There are generally no mottles. The substratum ranges from sand to silty clay loam or the gravelly, flaggy, cobbly, or very gravelly analogs of those textures. Consistence is friable or loose.

Udorthents

The Udorthents consist of excessively drained to moderately well drained soils near industrial sites, construction sites, and urban developments mostly in the city of Buffalo and adjacent suburbs. These soils are in variable manmade cut and fill areas and have very little or no profile development. Depth to bedrock and texture are quite variable.

Udorthents are too variable for a typical pedon to be described. In some representative pedons, the surface layer is 1 to 8 inches thick. Depth to bedrock is usually more than 5 feet. Coarse fragments, including gravel and cobblestones, range from 0 to 70 percent by volume in individual subhorizons. Reaction ranges from very strongly acid to moderately alkaline.

The surface layer has hue of 7.5YR through 5Y, value of 2 through 5, and chroma of 0 to 4. It is variable and ranges from loamy sand to silty clay loam or the gravelly or very gravelly analogs of those textures.

The substratum has hue of 5YR to 5Y or is neutral, has value of 2 to 6, and has chroma of 0 to 6. It is loamy sand to silty clay or the gravelly, cobbly, or very gravelly analogs of those textures. There is very weak or no structure. Consistence is friable to very firm, depending on the degree of compaction and texture of the soil.

Valois series

The Valois series consists of deep, well drained soils on reglaciated outwash moraines, lateral moraines, and recessional moraines. These soils formed in glacial till deposits dominated by material derived from sandstone, siltstone, and shale. Slope ranges from 3 to 25 percent but is dominantly 8 to 25 percent.

The Valois soils are associated with the Mardin, Volusia, Chenango, and Manlius soils. The Valois soils do not have a fragipan, and they have more gravel in the subsoil than the moderately well drained Mardin soils and the somewhat poorly drained Volusia soils. The Valois soils have less gravel in the subsoil than the Chenango soils and have a lower content of shale fragments and are deeper to bedrock than the Manlius soils.

Typical pedon of Valois gravelly silt loam, 8 to 15 percent slopes, in the town of Sardinia, on the west side of Pratham Road and 500 feet north of Allen Road:

Ap—0 to 8 inches; dark grayish brown (10YR 5/4) gravelly silt loam; weak medium granular structure; very friable; many fine roots; 25 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21—8 to 16 inches; yellowish brown (10YR 5/6) gravelly silt loam; weak fine subangular blocky structure; very friable; many fine roots; 20 percent coarse fragments; many fine roots; many fine and medium pores; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B22—16 to 31 inches; yellowish brown (10YR 5/4) gravelly loam; weak medium subangular blocky structure; friable; common fine roots; many fine pores; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B23—31 to 52 inches; brown (10YR 5/3) gravelly sandy loam; weak medium platy structure; friable; few fine roots in upper part; many fine and medium pores; 30 percent coarse fragments; strongly acid; clear wavy boundary.

IIC—52 to 65 inches; grayish brown (10YR 5/2) very gravelly sandy loam; weak medium granular structure with some stratification; very friable; porous; 50 percent coarse fragments; medium acid.

The thickness of the solum ranges from 30 to 70 inches. Bedrock is at a depth of 5 feet or more and commonly is deeper than 10 feet. Coarse fragments by volume range from 15 to 35 percent in the A horizon, 5 to 35 in the upper part of the B horizon, 20 to 35 percent in the lower part of the B horizon, and 35 to 70 percent in the C horizon below 40 inches.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is gravelly silt loam, gravelly loam, or gravelly fine sandy loam. Reaction ranges from very strongly acid to medium acid.

The B2 horizon has hue of 7.5YR to 2.5Y and value of 4 or 5. It is loam, silt loam, or sandy loam and, commonly, the gravelly analogs of those textures. It has very fine to medium subangular blocky structure but may be platy in the lower part in some profiles. Consistence is very friable to firm but is friable when the soil is removed. Reaction ranges from very strongly acid to medium acid.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. Texture ranges from very gravelly loam to very gravelly sandy loam below a depth of 40 inches. This horizon ranges from medium acid to neutral.

Varysburg series

The Varysburg series consists of deep, well drained and moderately well drained soils on dissected lake plains and valley sides where gravelly deposits are 20 to 40 inches thick over fine textured sediments. These soils formed in gravelly glacial outwash deposits and the underlying clayey lake sediments. Slope ranges from 0 to 40 percent but is dominantely 3 to 8 percent.

The Varysburg soils are associated with the Rhinebeck, Hudson, Canandaigua, Chenango, and Alton soils. The Varysburg soils have a gravelly mantle that the somewhat poorly drained Rhinebeck and moderately well drained Hudson soils do not have. The Varysburg soils are better drained and have a higher clay content than the Canandaigua soils, and are underlain with clayey deposits that are not in the Chenango and Alton soils.

Typical pedon of Varysburg gravelly loam, 3 to 8 percent slopes, in the town of North Collins, south of New Oregon-Wyandale Road, 0.2 mile east of the hamlet of New Oregon:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam; moderate medium granular structure; very friable; many fine roots; 30 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—9 to 15 inches; yellowish brown (10YR 5/6) very gravelly loam; weak fine and medium subangular blocky structure; very friable; common fine roots; many pores; 35 percent coarse fragments; strongly acid; clear wavy boundary.

B&A—15 to 21 inches; yellowish brown (10YR 5/4) very gravelly loam; weak fine and medium subangular blocky structure; friable; few fine roots; many fine pores with clay linings; coatings of pale brown (10YR 6/3) material 1 to 3 millimeters thick on ped faces; 40 percent coarse fragments; medium acid; gradual smooth boundary.

B21t—21 to 28 inches; dark brown (10YR 4/3) very gravelly loam; weak to moderate medium subangular blocky structure; friable; few fine roots; many pores with clay linings; clay skins on 30 percent of ped faces; 50 percent coarse fragments; slightly acid; abrupt smooth boundary.

IIB22t—28 to 33 inches; brown (7.5YR 5/2) silty clay; common fine faint yellowish brown (10YR 5/6) mottles; moderate medium blocky structure; firm; common fine pores with clay linings; continuous dark grayish brown (10YR 4/2) clay skins on faces of peds; neutral; clear smooth boundary.

IIB23t—33 to 41 inches; brown (7.5YR 5/4) silty clay; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to strong medium and coarse blocky; firm; common fine pores with clay linings; continuous clay skins on faces of peds; mildly alkaline; clear wavy boundary.

IIC—41 to 60 inches; brown (10YR 5/3) varved silty clay with thin layers of silt loam; common fine and medium faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; massive; firm; weakly calcareous; mildly alkaline.

The thickness of the solum ranges from 35 to 50 inches. Depth to carbonates is 35 to 60 inches. Depth to clayey material ranges from 20 to 35 inches. Coarse fragments range from 15 to 35 percent in the A horizon, increasing with depth to as much as 55 percent of the B horizon. Fragments are mostly gravel, but in places there are channery fragments. There are very few or no coarse fragments in the IIB and IIC horizons. Bedrock is at a depth of more than 5 feet.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 or 3. It is gravelly loam to gravelly sandy loam, but gravelly silt loam is most common. Reaction is strongly acid or medium acid.

The B1 horizon has hue of 7.5YR to 10YR, value of 4 or 5, and chroma of 4 through 6. Texture of the fine earth portion ranges from sandy loam through silt loam. Consistence is friable or very friable. Reaction is strongly acid or medium acid. The B&A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 through 4 in the B part. The B&A hroizon is silt loam, sandy loam, or loam with gravelly or very gravelly analogs of those textures. Consistence is friable or firm. Reaction is strongly acid or medium acid. The B2t horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 4. Texture is very gravelly silt loam to very gravelly sandy loam. Reaction ranges from slightly acid to mildly alkaline.

The IIBt horizon has hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 2 through 4. Mottles are few or common. Texture is silty clay loam or silty clay. Consistence is firm or very firm. Reaction ranges from slightly acid to mildly alkaline.

The IIC horizon hues are similar to those of the IIBt horizon. Texture is silty clay or clay with varves of silt or silt loam common in many pedons.

Volusia series

The Volusia series consists of deep, somewhat poorly drained soil on broad divides of the dissected, glaciated upland plateau. These Volusia soils formed in the firm basal till dominated by material derived from siltstone, sandstone, and shale. These soils have a firm, dense fragipan layer in the subsoil. Slope ranges from 0 to 8 percent, but it is dominantly 3 to 8 percent.

The Volusia soils formed in a similar kind of parent material to that of the associated poorly drained Chippewa soils and the moderately well drained Mardin soils. They are also associated with the Erie and Langford soils. The Volusia soils do not have the clay accumulation in the subsoil that is in the somewhat poorly drained Erie soils and in the moderately well drained and well drained Langford soils.

Typical pedon of Volusia channery silt loam, 3 to 8 percent slopes, in the town of Concord, near Brown Hill Road and 1.3 miles northeast of Wyandale Road:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) channery silt loam; weak medium granular structure; very friable; many fine roots; 20 percent coarse fragments; medium acid; abrupt smooth boundary.

A2—9 to 15 inches; light brownish gray (10YR 6/2) channery silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; very weak medium platy structure; friable; common fine roots; common fine pores; 20 percent coarse fragments; medium acid; clear irregular boundary.

Bx—15 to 50 inches; olive brown (2.5Y 4/4) channery loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; strong very coarse prisms separated by thin streaks of light brownish gray silt; distinct coarse yellowish brown mottles at the edge of the silt streaks; very firm and brittle; few roots in upper part between prism faces; few fine pores with some clay linings; 30 percent coarse fragments; medium acid; gradual wavy boundary.

C—50 to 60 inches; dark grayish brown (10YR 4/2) very channery loam; many faint dark yellowish brown (10YR 4/4) mottles; massive; very firm; 35 percent coarse fragments; slightly acid.

The thickness of the solum ranges from 40 to 70 inches. Depth to the fragipan ranges from 10 to 20 inches. Coarse fragments range from 5 to 30 percent in the A and B horizons and from 10 to 50 percent in the C horizon. At least one horizon between the Ap horizon and a 20-inch depth has a matrix or ped face chroma of 2.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3. It is silt loam or loam and, commonly, the channery analogs of those textures. Reaction ranges from very strongly acid to slightly acid. The A2 horizon has hue of 10YR to 5Y, value of 4 to 6, and chorma of 2 or 3. It has common or many distinct or prominent mottles higher in chroma than the matrix. The A2 horizon is loam or silt loam or the channery analogs of those textures. It has very weak or weak platy or blocky structure, or it is massive. Consistence is friable or firm. The A2 horizon is replaced by a thin B2 horizon in some pedons. Reaction ranges from very strongly acid to slightly acid.

The Bx or B'X horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. These horizons have few or common, faint to distinct mottles. They are dominantly loam or silt loam but range to light silty clay loam and, commonly, the channery analogs of those textures. Consistence is firm through extremely firm. Reaction ranges from strongly acid to neutral.

The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. Texture is loam or silt loam and, commonly, their channery or very channery analogs. The horizon is massive or has lenticular platy structure, and consistence is firm or very firm. Reaction ranges from medium acid to moderately alkaline.

Wassaic series

The Wassaic series consists of moderately deep, well drained and moderately well drained soils. These soils formed in glacial till deposits derived mostly from limestone and some sandstone, shale, and granitic erratics. Slope ranges from 0 to 40 percent but is dominantly 0 to 3 percent.

The Wassaic soils are associated with the deep Honeoye, Lima, and Appleton soils and with the Cazenovia and Ovid soils but are shallower to bedrock than those soils. They also do not have the red color of the Cazenovia and Ovid soils. The Wassaic soils are often near the moderately deep Newstead soils, but are better drained.

Typical pedon of Wassaic silt loam, 0 to 3 percent slopes, in the town of Clarence, 2 miles west-southwest of the village of Clarence and 0.3 mile south of New York Highway 5:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) crushed; moderate medium granular structure; friable, slightly plastic; many fine roots; 10 percent coarse fragments; neutral; abrupt smooth boundary.

A2—9 to 10 inches; grayish brown (10YR 5/2) loam; weak thin platy structure; friable, nonplastic; common fine roots; common fine cylindrical vertical pores; 10 percent coarse fragments; neutral; abrupt wavy boundary.

B&A—10 to 14 inches, brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm, slightly plastic; common fine roots; 1- to 2-millimeter fingers of pale brown (10YR 6/3) loam extend from the A2 horizon along ped faces; many fine cylindrical and spherical pores; few clay films in pores; 10 percent coarse fragments; slightly acid; clear wavy boundary.

B2t—14 to 23 inches; brown (7.5YR 4/4) gravelly silt loam; moderate medium subangular blocky structure; firm, plastic; few fine roots; common fine pores; brown to dark brown (7.5YR 4/2) clay films on 50 percent of ped faces and in most pores; 20 percent coarse fragments; neutral; clear wavy boundary.

C—23 to 28 inches; brown (7.5YR 5/2) gravelly loam; weak medium platy structure; firm, slightly plastic; few fine roots; few pores; 25 percent coarse fragments; calcareous; mildly alkaline; abrupt smooth boundary.

IIR—28 inches; hard gray limestone bedrock.

The thickness of the solum ranges from 20 to 36 inches, and depth to bedrock ranges from 20 to 40 inches. Coarse fragments range from 0 and 35 percent by volume in the A horizon and 3 to 35 percent in the B and C horizons. In some places, the surface is very stony.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. Texture is silt loam, loam, or fine sandy loam in the fine earth fraction. Structure is weak or moderate granular. Reaction ranges from medium acid to neutral. The A2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. Texture is fine sandy loam, loam, or silt loam in the fine earth fraction. Structure is weak platy or subangular blocky. If there is an A2 horizon, the material in it interfingers into the B2t horizon. Reaction ranges from medium acid to neutral.

The Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. In places, it has mottles of high chroma. The Bt horizon is loam, silt loam, or light clay loam or the gravelly analogs of those textures. The average clay content is 18 to 35 percent. Structure is medium or coarse subangular blocky. Reaction ranges from medium acid to neutral.

There is no C horizon in some pedons. When there is a C horizon, hue is 5YR to 10YR, value is 4 or 5, and chroma is 2 or 3. Structure is platy or the material is massive. The C horizon is loam to light silty clay loam or the gravelly analogs of those textures. Reaction ranges from medium acid to mildly alkaline.

Wayland series

The Wayland series consists of deep, poorly drained and very poorly drained soils in the lowest parts of flood plains, commonly in slack water areas farthest from the stream. These soils formed in recent alluvial deposits on flood plains. Slope ranges from 0 to 3 percent.

The Wayland soils are associated with the Chenango, Tioga, Hamlin, Middlebury, and Teel soils. The Wayland soils are more poorly drained than the well drained to somewhat excessively drained Chenango soils, the well drained Tioga and Hamlin soils, and the moderately well drained to somewhat poorly drained Middlebury and Teel soils. They do not have the loamy texture and high gravel content of the Chenango soils, the sand and gravel of the Tioga soils, and the coarse silt of the Hamlin soils.

Typical pedon of Wayland silt loam, in the town of Newstead, 0.3 mile north of Tonawanda Creek Road and 0.4 mile west of New York Highway 93:

AP—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) crushed and smoothed; moderate medium subangular blocky structure; firm; many fine and very fine roots; neutral, clear smooth boundary.

Bg—9 to 28 inches; dark gray (10YR 4/1) silt loam; common medium distinct dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; firm; common fine and very fine roots; neutral; gradual wavy boundary.

Cg—28 to 45 inches; dark gray (10YR 4/1) silt loam; common medium distinct brown (10YR 4/3) mottles; weak coarse platy structure; firm; common very fine roots; neutral; abrupt wavy boundary.

IIC2—45 to 55 inches; dark gray to dark grayish brown (2.5Y 4/1) stratified silt loam and very fine sand; massive; firm; calcareous; moderately alkaline.

The thickness of the silty deposits over contrasting coarser textured material ranges from 36 inches to more than 60 inches. Bedrock is deeper than 60 inches. There are generally no coarse fragments, but they range from 0 to 5 percent above a depth of 36 inches.

The A1 of Ap horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. The texture is silt loam or silty clay loam. Reaction ranges from strongly acid to mildly alkaline.

The Bg horizon has hue of 7.5YR through 5Y, value of 3 through 6, and chroma of 1 or 2. Texture is silt loam or light silty clay loam. Structure ranges from weak or moderate, fine to coarse subangular blocky to weak or moderate prismatic. Consistence is friable or firm. Reaction ranges from strongly acid to moderately alkaline. There is no Bg horizon in some pedons.

The Cg horizon has hue and texture similar to those of the Bg horizon but has platy structure or is massive. Some pedons have a IIC horizon with hue similar to that of the Cg horizon but with textures ranging from stratified silt loam to gravelly fine sandy loam.

Williamson series

The Williamson series consists of deep, moderately well drained soils on lake plains or remnant stream terraces. These soils formed in silty lacustrine or deltaic deposits. Slope ranges from 3 to 15 percent but is dominantly 3 to 8 percent.

The Williamson soils are associated with the Rhinebeck soils on lake plains but do not have the clayey texture and are better drained. The Williamson soils are also associated with the Bath and Mardin soils in the upland areas but do not have the loamy texture and coarse fragments of these soils.

Typical pedon of Williamson silt loam, 3 to 8 percent slopes, in the town of Colden, 500 feet east of Bleistern Road and 600 feet north of Partridge Road:

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam; weak fine subangular blocky structure parting to moderate medium granular; friable; many fine roots; many fine pores; strongly acid; abrupt smooth boundary.

B2—7 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; few very dark grayish brown (10YR 3/2) worm channels 5 to 10 millimeters in diameter; 2 percent coarse fragments; strongly acid; clear wavy boundary.

A'2—15 to 18 inches; pale brown (10YR 6/3) silt loam; few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; few fine roots; few medium pores; strongly acid; abrupt irregular boundary.

B'xl—18 to 30 inches; brown (10YR 5/3) very fine sandy loam; prismatic structure parting to moderate medium platy; very firm, brittle; prisms 10 to 15 inches across separated by 1/4- to 1/2-inch borders of very pale brown (10YR 7/3) surrounded by strong brown (7.5YR 5/6) mottles or streaks; many medium pores; strongly acid; gradual wavy boundary.

B'x2—30 to 45 inches; yellowish brown (10YR 5/4) very fine sandy loam; coarse moderate distinct strong brown (7.5YR 5/6) and pale brown (10YR 6/3) mottles; moderate very coarse prismatic structure parting to weak thin platy; firm; brittle; prisms 8 to 10 inches across are separated by 1/8 to 1/4 inch of light brownish gray (2.5Y 6/2) very fine sand; common medium pores; 2 percent coarse fragments, strongly acid; gradual wavy boundary.

IIC—45 to 55 inches; yellowish brown (10YR 5/4) silt loam, common medium distinct light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) mottles; weak thin platy structure, friable, strongly acid; abrupt smooth boundary.

IIIC—55 to 60 inches; brown (10YR 5/3) loamy very fine sand; single grain; very friable, strongly acid.

The thickness of the solum ranges from 35 to 60 inches. Where there are carbonates, they generally are below 6 feet. The silt or very fine sand deposits range from a depth of 40 inches to 30 feet or more. Bedrock is at a depth of 5 feet or more. Coarse fragments are less than 2 percent throughout the soil.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. Texture is silt loam, very fine sandy loam, or fine sandy 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. In places this horizon has common, faint mottles. Texture is silt loam or very fine sandy loam. Structure is very weak or weak granular or subangular blocky. Reaction ranges from very strongly acid to medium acid.

The A'2 horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 3 or 4. This horizon has common to many, distinct to prominent mottles that have chroma of 3 to 6. Texture is silt loam or very fine sandy loam. Structure is weak platy or the horizon is massive. Reaction ranges from very strongly acid to medium acid.

The B'x horizon has hue of 2.5YR to 2.5Y, value of 4 or 5, and chroma of 3 or 4. Mottles are few to common, medium to coarse, and faint to distinct. This horizon is silt loam or very fine sandy loam. It is massive or has platy structure within weak to moderate, very coarse prisms. 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. This horizon is typically silt loam or stratified silt loam and very fine sandy loam. Thin layers of loamy very fine sand are common. This horizon has platy structure or is massive. Reaction ranges from strongly acid to neutral.

formation of the soils

This section discusses the factors of soil formation and relates them to specific soils in the survey area. It defines the processes of soil horizon development as they are related to soil formation in Erie County.

factors of soil formation

Soils are natural three-dimensional bodies at the earth's surface. They 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 combination of the following factors at that point: the physical and chemical composition of the parent material, the climate, the topography, the plant and animal life, and time. The relative influence of each of these major 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 the topography and by the nature of the parent material. In some places the influence of one factor is dominant.

In the following pages, the five major factors of soil formation are discussed in relation to their effects on the soils in Erie County.

parent material

Parent material is the unconsolidated earthy mass from which soils formed or are forming. It determines the mineralogical composition and contributes largely to the chemical composition of the soil. It also influences the soil color and, to a great extent, the rate at which soils form. Most of the soils in Erie County formed in different types of deposits left as the result of glaciation. Glacial till is the most extensive source of parent material. Smaller areas were derived from glaciolacustrine (lake-laid) sediments and glaciofluvial (outwash) deposits. Some soils formed in more recent deposits of stream alluvium and in accumulations of organic matter.

Soils that formed in glacial till deposits have a wide range of characteristics because of the heterogeneous mixture of rock and soil particles. The deeper soils commonly have a firm fragipan or a compact substratum. The Mardin, Lima, and Erie soils formed in deep glacial till deposits. In places the till mantle is moderately deep or shallow over bedrock. The Manlius, Aurora, and Farmington soils formed in these deposits. In Erie County, the underlying bedrock formations are variable and include sandstone, limestone, shale, and siltstone. The till deposits have a high content of material derived from the underlying bedrock.

As the glacial ice melted, enormous quantities of melt water carried and sorted soil and rock debris. This outwash material was redeposited as sand and gravel on outwash plains, valley terraces, kames, eskers, and deltas. The Chenango and Blasdell soils formed in this material. Beach ridges along the borders of former glacial lakes resulted from the sorting and depositing of soil particles by waves. The Alton soils formed in these medium textured to coarse textured deposits.

At one time many of the larger valleys and the lake plain area in the northern part of Erie County contained glacial lakes in which melt water was trapped. The bulk of the stone-free sediment deposited from this melt water was clayey or silty. The Rhinebeck, Collamer, and Schoharie soils formed in these fine textured to medium textured deposits.

In recent time, overflowing streams have deposited fresh dark alluvial material on flood plains. Soils that formed in this material are generally silty and have weak soil profiles. The Tioga and Teel soils are examples. Soils in low bogs and swamps, which formed in organic deposits, are called muck. The Edwards and Palms soils are typical mucks.

climate

Climate—particularly temperature, precipitation, and frost action—is one of the most influential of the soil-forming factors. It determines the kind of weathering processes that occur and the translocation of weathered material. It affects the kind of vegetation and the rate at which it grows. It also affects the leaching of soils through precipitation.

Erie County has a humid continental climate marked by extreme seasonal changes in temperature. This type of climate tends to develop moderately weathered, leached soils. The average temperature of the Erie-Ontario lowlands and the south-facing slopes is different enough from the temperature at the higher elevations of the Allegheny Plateau uplands to cause some differences among the soils. More detailed information on climate is given in "General Nature of the County".

topography

The shape of the land surface, or lay of the land, the slope, and the position of the parent material in relation to the water table have had much influence on the formation of soils in the county. Soils that formed in convex sloping areas where there is little runoff or where runoff is moderate or rapid, generally are well drained and have a bright-colored, unmottled subsoil. These soils 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, the soils generally exhibit some evidence of wetness, 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, the soils show evidence of wetness to a marked degree. They have a dark colored, thick, organic surface layer and a strongly mottled or grayish subsoil. Some soils are wet because they have a high water table or because they occupy a position on the landscape where water accumulates and is perched above impervious layers in the subsoil or substratum. Permeability of the soil material, as well as length, steepness, and configuration of slopes, influences the kind of soil that is formed. Local differences in the soils of Erie County are largely the result of differences in parent material and topography.

plant and animal life

All living organisms are important to soil formation. These include plants, animals, bacteria, and fungi. Vegetation is generally responsible for the amount of organic matter and nutrients in the soil and the color and structure of the surface layer. Animals, such as earthworms and burrowing animals, help keep the soil porous and more permeable to air and water. Their waste products cause aggregations of soil particles and improve soil structure. Bacteria and fungi decompose vegetation, which releases nutrients for plant use.

Erie County was originally in native forest of northern hardwoods and pines. The hardwoods take up large quantities of bases (nutrients) from the soil and return them to the surface each year as leaf litter. Conifers, such as pines, do not use large amounts of nutrients. Because rooting depth is shallow in many of the soils, many trees are uprooted and there is much mixing of the soil material. Man has also caused changes in soils by clearing the forests and cultivating the land. He has added nutrients through fertilizers, has mixed some soil horizons by plowing, and has accelerated erosion in many areas.

time

Time, or the age of a soil, is a passive but important soil-forming factor. The degree of profile development reflects the age of a soil, but it reflects the influence of the other factors as well. In geological terms, the soils of Erie County formed in relatively young deposits. Most of the material was deposited after the last glacier retreated 10,000 to 15,000 years ago. All of the soils have not reached the same stage of development, however, because other soil-forming factors also influence the rate and kind of profile development.

The Collamer and Honeoye soils appear younger than the Mardin and Chenango soils, but this is caused by a difference in parent material. All of these soils have well-defined horizons. An immature soil has not had enough time for distinct horizons to form. The Tioga and Wayland soils that are forming in alluvial sediments on flood plains are such soils. They are immature because they still receive periodic depositions of fresh alluvium.

processes of soil horizon development

The soil-forming factors cause different layers, or soil horizons, to form. These horizons can be viewed in a vertical cut of soil known as a soil profile. The soil profile extends from the surface downward into material that is little altered by the soil-forming processes. Most soils contain three major horizons called A, B, and C horizons (*7*).

There are several processes involved in the formation of the soil horizons. These processes include the accumulation of organic matter, leaching of soluble salts and minerals, the translocation of silicate clay minerals, the reduction and transfer of iron, and the formation of dense, or compact, layers in the subsoil.

The accumulation of organic matter takes place as plant residues decompose. This process darkens the surface layer and helps to form the A1 horizon. It takes a long time to replace this organic matter once it has been lost. The surface layer of the soils in Erie County contains about 3.5 percent organic matter.

For soils to develop distinct subsoil horizons, some of the lime and other soluble salts must be leached before other soil processes, such as translocation of clay minerals, can take place. Many factors affect leaching, including the kinds of salts originally in the soils, the rate and depth of percolation, and the texture of the soil.

One of the more important processes of soil horizon development is the translocation of silicate clay minerals. The amount of clay minerals in a soil is inherent in the parent material, but clay amounts vary from one soil 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 rock fragments. In some soils, an A2 horizon has formed by considerable eluviation of clay minerals to the B horizon. The Collamer soil has a higher clay content in the B horizon than in the A horizon because of the translocation process.

The reduction and transfer of iron compounds occur mainly in the more poorly drained soils. This process is known as gleying. In poorly drained and very poorly drained soils, such as the Lyons and Getzville soils, the grayish subsoil indicates the reduction and the removal and transfer of iron in solution. In moderately well drained to somewhat poorly drained soils, such as the Elnora or Appleton soils, yellowish brown and reddish brown mottles indicate the segregation of iron compounds. The bright, unmottled subsoil of the Arkport soil indicates that it is well drained and that the reduction and transfer of iron has not taken place.

Some of the soils in Erie County have developed a distinct fragipan in the subsoil. These horizons are very firm and brittle when moist and very hard when dry. Their genesis is not fully understood. Studies (*5*) indicate that swelling and shrinking take place in alternating wet and dry periods, which may cause the dense packing of soil particles, the low pore space, and the gross polygonal pattern of vertical cracks found in most fragipans. Clay, silica, and oxides of aluminum are the cementing agents that cause brittleness and hardness. The Erie, Langford, and Chippewa soils have a well expressed fragipan.

Many well drained and moderately well drained soils in the county have a strong brown, yellowish brown, or reddish brown subsoil. These colors are mainly caused by thin coatings of iron oxides on sand and silt particles. A bright colored subsoil with an iron oxide coating is commonly termed a color B horizon. These soils have normally developed subangular blocky structure but contain little or no clay translocated from the surface horizon. The Chenango and Scio soils have a color B horizon.

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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

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

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.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

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. 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.

Congeliturbate. Soil material disturbed or moved by frost action (solifluction).

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

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 (Aeolian). Earthy material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime. Excess carbonates in the soil that restrict the growth of some plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long. (Flaggy soil).

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.

Fragile. A soil that is easily damaged by use or disturbance.

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.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

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.

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.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

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.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Kettle (geology). A depression in the ground surface formed by the melting of an ice block buried in glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain(geology). An area dominated by low lying relief that formed at the bottom of a glacial lake during 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 3 inches (7.5 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 area. An area that has little or no natural soil and supports 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.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

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, 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.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

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

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

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.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

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.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

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 3 inches (7.5 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 water soaks into the soil or flows slowly to a prepared outlet. 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 loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

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 lowlands 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.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.