Series 1952, No. 1 Issued May 1958

SOIL SURVEY

Franklin County New York

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

THIS SURVEY of Franklin County will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils; shows their location on a map; and tells what they will do under different kinds of management.

How the Soil Survey Is Made

To make a detailed soil survey, the soil scientist works mostly on foot. He walks over the survey area and digs or bores many holes so that he can observe the different soil layers and study the characteristics that show the suitability of the soils for agriculture or other uses. To measure the steepness of slopes, he uses a hand level. He takes note of the lay of the land, the kinds of crops or wild plants and their habits of growth, the nature of exposed rock, and any other external evidences of the nature and extent of each kind of soil. On an aerial photograph or map, he draws boundary lines between the different soils. Before mapping of the area is completed, he samples and describes each layer of each soil that occurs there, and studies the color, texture, consistence, structure, and other internal characteristics. From the information that the soil scientist gathers during the field survey and from the results of laboratory analysis of soil samples, the detailed soil descriptions that are part of each soil survey report are prepared. These data are also the basis on which soils are classified into soil series and into the higher orders of soil classification.

How To Use This Report

In the back of this book is a set of aerial photographs, that together make up a map of the parts of Franklin County that were surveyed in detail. On these photographs are shown in red the boundaries of each kind of soil. Roads, streams, houses, and other landmarks that show on the photographs make it easy to locate any area in which you may be interested. An inch on this aerial map represents about 1,667 feet on the ground, and a square inch includes about 64 acres.

Within each soil boundary on the map is a letter symbol that represents the soil name. For example, Cka is the symbol for Covington silty clay loam, 0 to 2 percent slopes. All areas on the map that are marked with this symbol are the same kind of soil. When you have located on the map, by reference to landmarks, the farm or other tract of land in which you are interested, and have noted the soil symbols, look in the map legend to find the name of the soils that the symbols represent. Then you can refer to the section of the report, Descriptions of Soils, for detailed description of each of the soils, and to the section, Management of Franklin County Soils, for information about the fertility of each soil, its use suitability, and its management needs.

The section, Soil Associations, and the colored map of soil associations that is in a pocket at the back of the report give a general picture of the soils of larger areas than those marked on the detailed maps. Other parts of the report provide information on types of agriculture in the county, and on other industries, transportation, markets, and other subjects that have a bearing on land use planning.

This publication on the soil survey of Franklin County, New York, is a cooperative contribution from—

SOIL CONSERVATION SERVICE

and

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

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SOIL SURVEY OF FRANKLIN COUNTY, NEW YORK

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Correlation by WALTER H. LYFORD

United States Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station

THIS SURVEY of the soils of Franklin County, N. Y., was made jointly by the United States Department of Agriculture and the Cornell University Agricultural Experiment Station. Soil scientists from these two agencies made a detailed survey of soils in the northern third of Franklin County, and a general (or reconnaissance) survey of the mountainous areas in the southern part of the county. The information in this report of the soil survey will help farmers to plan how to use the soils on their farms and will help others who are concerned in any way with use and management of the soils.

The fieldwork for this survey was begun in 1947 and completed in 1953. Unless otherwise specifically noted, all statements in this report refer to conditions at the time the survey was in progress.

Management of Franklin County Soils

This section of the report is a general guide to the use, management, and conservation of the soils of Franklin County. It does not give specific management suggestions that are applicable to a particular soil in every instance. Farmers who would like help in deciding what crops and rotations are best suited to their farms, how much lime and fertilizer to use on a particular field for a particular crop, and what erosion control practices are needed, may call on the county agent or a local representative of the Soil Conservation Service for advice.

The discussion of management is in three parts: The first covers general use suitability and management needs by groups of soils; the second is concerned with suitable cropping systems and supporting practices for each group of soils; and the third gives estimates of yields under common management and under improved management.

Soil Management Groups

For the purpose of discussing management requirements, the 132 mapping units in Franklin County have been placed in 26 management groups. All the soils in any one group are similar in use suitability and management needs. Management groups 1 to 15, inclusive, consist of soils that are suitable for crops. Groups 16 and 17 are too wet for crops unless artificially drained. Soils of groups 18 to 26, inclusive, are not suitable for crops because they are stony, wet, steep, or severely eroded.

The information in this section is a general guide for the use, management, and conservation of the soils of the county.

Soil management group 1

Much of the cropland of Franklin County is in management group 1. It consists of loamy soils that have formed on low-lime stony glacial till. All the soils have in the subsoil a compact pan horizon, generally beginning at a depth of about 20 inches. Two of the mapping units contain areas of well-drained Becket soils; all the other soils of the group are moderately well drained. Permeability is moderate in the subsoil and slow in the compact pan horizon. The soils are productive if adequately limed and fertilized. The group consists of the following mapping units:

Becket and Skerry stony sandy loams, 3 to 8 percent slopes (Bab).
Becket and Skerry stony sandy loams, 8 to 15 percent slopes (Bac).
Empeyville stony very fine sandy loam, 0 to 3 percent slopes (Eaa).
Empeyville stony very fine sandy loam, 3 to 8 percent slopes (Eab).
Empeyville stony very fine sandy loam, 8 to 15 percent slopes (Eac).
Empeyville and Moira stony very fine sandy loams, 15 to 25 percent slopes (Ecd).
Moira stony loam, 0 to 3 percent slopes (Mea).
Moira stony loam, 3 to 8 percent slopes (Meb).
Moira stony loam, 8 to 15 percent slopes (Mec).

Fertility.—These soils are naturally strongly acid; they are low in phosphorus and potassium and medium in organic matter. They need lime to give good yields of crops in a dairy rotation. Phosphorus and potassium must be applied to get good yields of corn, oats, and forage crops.

Water-supplying capacity.—The water-supplying capacity is medium. The soils supply enough moisture for high yields in favorable years and for moderate yields in most other years. Group 1 soils dry out more slowly

[1] Fieldwork for this survey was done when Soil Survey was part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

in the spring, and in drier than average years they supply more moisture for crops than the soils of group 2. In wetter than average years, they may be so wet that corn will fail to grow.

Other features.—These soils generally contain enough stones to interfere with, but not prevent, cultivation. In most areas stones must be removed regularly if tilled crops are to be grown

Some areas, especially in the eastern part of the county, are divided by stone fences into small fields. This interferes with the use of power machinery.

Growth of plant roots, as a rule, is restricted to the 20 inches of soil above the pan horizon.

Becket and Skerry soils occur at higher elevations than the other soils of the group and have a somewhat shorter growing season.

Many of the areas that have slopes of more than 8 percent are narrow strips that border drainageways. Such areas are usually not cropped.

Suitability for crops.—If properly limed and fertilized, this group of soils is well suited to corn for silage, potatoes, oats, medium red clover, timothy, and birdsfoot trefoil. The soils are not well suited to alfalfa because of the restricted soil drainage, the strongly acid subsoil, and the compact pan horizon.

Cropping systems and erosion control practices.—These soils are suited to relatively short rotations. If intertilled crops are grown oftener than once in 3 years, special practices are necessary to control erosion, especially on slopes steeper than 3 percent.

Soil management group 2

Group 2 contains loamy well-drained soils that have developed on low-lime stony glacial till. A weakly to moderately developed pan horizon, which occurs about 2 feet below the surface, restricts root growth. Permeability of the surface layers and subsoil is moderate. There are several thousand acres of these soils in the county, and they are used for general farm crops. The soils are productive when adequately limed and fertilized, but the lime and fertilizer needs are high. The group consists of the following mapping units.

Hermon stony sandy loam, 3 to 15 percent slopes (Hac).
Parishville stony loam, 2 to 8 percent slopes (Pbb).
Worth stony fine sandy loam, 0 to 3 percent slopes (Wqa).
Worth stony fine sandy loam, 3 to 8 percent slopes (Wqb).
Worth stony fine sandy loam, 8 to 15 percent slopes (Wqc).

Fertility.—The soils of group 2 are naturally strongly acid; they are low in phosphorus and potassium and medium to low in organic matter. They need lime to give good yields of crops in a dairy rotation. Phosphorus and potassium must be applied to get good yields of corn, oats, and forage crops. Because these soils are better drained, they supply nitrogen to crops earlier in the spring than the soils of groups 1 and 3.

Water-supplying capacity.—The capacity of these soils to supply water to crops is medium. Soil moisture is adequate for high yields in favorable years and for moderate yields in most other years. The soils can be worked earlier in the spring than the soils of groups 1 and 3. In drier than average years, however, they will supply less water to crops than soils of groups 1 and 3.

Other features.—The soils contain enough stones to interfere with, but not to prevent, cultivation. In most areas stones must be removed at regular intervals if tilled crops are to be grown.

Growth of plant roots, as a rule, is restricted to the 20 to 24 inches of soil above the pan horizon.

The Hermon soil, which occurs at higher elevations, has a somewhat shorter growing season than the other soils of management group 2.

Suitability for crops.—If properly limed and fertilized, the soils of this group are well suited to corn for silage, potatoes, oats, medium red clover, timothy, and birdsfoot trefoil. They should be suited to alfalfa if adequately limed and fertilized, but not many farmers have grown alfalfa on these soils.

Cropping systems and erosion control practices.—These soils are suited to comparatively short rotations. If row crops are grown oftener than once every 3 years, special practices to control erosion are necessary, especially on slopes steeper than 3 percent.

Soil management group 3

Group 3 consists of loamy soils that have formed on low-lime stony glacial till. They are somewhat poorly drained to poorly drained. A compact pan horizon below 16 or 18 inches restricts root growth and water movement. Permeability is moderate in the surface soil and subsoil and slow in the pan horizon and substratum. A large part of these extensive soils is cropped. Properly fertilized, the soils are productive of hay and pasture. The group consists of the following mapping units:

Brayton stony loam, 0 to 3 percent slopes (Bea).
Brayton stony loam, 3 to 8 percent slopes (Beb).
Ridgebury stony sandy loam, 0 to 8 percent slopes (Rbb).
Westbury and Dannemora stony very fine sandy loams, 0 to 3 percent slopes (Wma).
Westbury and Dannemora stony very fine sandy loams, 3 to 8 percent slopes (Wmb).

Fertility.—Except for the Brayton soils, all of the soils in this group are naturally strongly acid and require lime for good yields of crops in the rotations used on dairy farms. The Brayton soils generally need less lime than other soils in the group. The soils are naturally low in phosphorus and potassium, and these elements must be added to get good yields of forage crops. The soils are high in organic matter. Because they remain cold and wet longer than soils of groups 1 and 2, however, the amount of nitrogen supplied by group 3 soils is likely to be deficient until early summer, long after the better drained soils are supplying large amounts.

Water-supplying capacity.—The capacity of these soils to supply water to crops is high. Soil moisture is adequate for high yields in most years. Because the soils remain cold and wet much later in the spring than soils of groups 1 and 2, seeding is often delayed and yields are consequently lower. In dryer than average years, however, the soils may outyield the better drained soils because of their superior water-supplying capacity.

Other features.—Group 3 soils generally contain enough stones to interfere with, but not to prohibit, cultivation. In most areas stones must be removed regularly if tilled crops are to be grown.

Growth of plant roots is practically limited to the 16 or 18 inches of soil above the pan horizon.

The Ridgebury soil occurs at higher elevations than the other soils of the group, so it has a somewhat shorter growing season than the others.

Suitability for crops.—Because of restricted soil drainage, these soils are not well suited to corn or oats. When partially drained and properly limed and fertilized, they produce moderate yields of forage crops. The soils are suited to Ladino clover, alsike clover, birdsfoot trefoil, timothy, and redtop.

Cropping systems and erosion control practices.—Because these soils are best suited to forage crops grown in comparatively long rotations, special practices to control erosion are seldom necessary.

Soil management group 4

Group 4 contains loamy soils that have formed on high-lime stony glacial till. The Grenville soils of the group are well drained, and the Hogansburg soil is moderately well drained. Permeability is moderate in the subsoil and substratum. The soils are high in lime. They are especially well suited to alfalfa. About 9,000 acres of group 4 soils occur in the northwestern part of the county. The group consists of the following mapping units:

Grenville stony loam, 2 to 8 percent slopes (Gab).
Grenville stony loam, 8 to 15 percent slopes (Gac).
Hogansburg stony loam, 2 to 8 percent slopes (Hbb).

Fertility.—The soils of group 4 are high-lime soils. They have a natural supply of free lime within 2 or 3 feet of the surface, so it is seldom necessary to apply ground limestone. The soils are naturally low in phosphorus and potassium, and these elements must be added if good yields of corn, oats, and forage crops are to be obtained. Potassium is especially needed if alfalfa is grown. The organic-matter content is medium.

Water-supplying capacity.—The water-supplying capacity is medium. Soil moisture is adequate for high yields in favorable years and for moderate yields in most other years. Because the Grenville soils are slightly better drained than the Hogansburg soil, they can often be seeded somewhat earlier. In drier than average years, however, the Hogansburg soil may outyield the Grenville soils, because of its somewhat higher moisture-supplying capacity.

Other features.—Group 4 soils generally contain enough stones to interfere with, but not to prevent, cultivation. In most areas it is necessary to remove the stones regularly if row crops are to be grown.

Suitability for crops.—If properly fertilized these soils are well suited to corn for silage, oats, alfalfa, medium red clover, birdsfoot trefoil, and timothy.

Cropping systems and erosion control practices.—The soils of group 4 are suited to short rotations because they can produce good yields of corn for silage. They are often used for long rotations, however, because of their suitability for alfalfa. If rotations are used in which row crops are grown once in 3 years, or oftener, special practices to control erosion are necessary, especially on slopes steeper than 3 percent.

Soil management group 5

Group 5 contains only one soil, which is poorly drained and loamy and has formed on high-lime glacial till. About 3,000 acres of this soil occurs in Franklin County, and a large part of the acreage is cropped. Poor soil drainage limits the use of the soil, but if partially drained, it produces good hay and pasture. Permeability of both the surface soil and the subsoil is moderate. The following mapping unit is in group 5:

Massena stony loam, 0 to 4 percent slopes (Mca).

Fertility.—This is a high-lime soil in which free lime occurs naturally within 3 feet of the surface. Liming is generally unnecessary, but in some areas small amounts of lime, applied at intervals of several years, may be beneficial. The soil is naturally low in phosphorus and potassium, and these elements must be added if good yields of forage crops are to be obtained. The organic-matter content is high. Because of poor soil drainage, the amount of nitrogen supplied by this soil is commonly deficient until early summer, long after better drained soils are supplying large amounts.

Water-supplying capacity.—The capacity of the soil to supply water for crops is high. In most years soil moisture is adequate for high yields. The water supply is seriously limited only during prolonged droughts. This soil usually remains wet long after the better drained soils are dry enough to be cultivated. In unusually dry years, when it can be seeded early, it will usually produce higher yields than associated better drained soils.

Other features.—This soil generally contains enough stones to interfere with, but not to prevent, tillage. In most areas stones must be removed regularly if row crops are to be grown.

Suitability for crops.—This soil is too wet to be well suited to corn, potatoes, or oats. When partly drained and properly fertilized, it is suited to such forage crops as Ladino clover, alsike clover, birdsfoot trefoil, timothy, and redtop.

Cropping practices and erosion control practices.—This soil is best suited to forage crops grown in comparatively long rotations. If it is used for this purpose, special practices to control erosion are seldom necessary.

Soil management group 6

Group 6 contains loamy soils that have formed on fine sand and silt deposited in shallow glacial lakes. The Salmon soils are well drained, and the Nicholville soils, moderately well drained. Permeability is moderate in the surface soil and subsoil and slow in the underlying glacial till. Group 6 soils total about 10,700 acres. They occur most extensively south of Malone and west of the valley of the Salmon River. When properly limed and fertilized, the soils are very productive. They are more susceptible to erosion, however, than most other soils of the county. The group consists of the following mapping units:

Nicholville fine sandy loam, 0 to 2 percent slopes (Naa).
Nicholville fine sandy loam, 2 to 6 percent slopes (Nab).
Nicholville fine sandy loam, 6 to 12 percent slopes (Nac).

Nicholville stony fine sandy loam over till, 0 to 2 percent slopes (Nba).
Nicholville stony fine sandy loam over till, 2 to 6 percent slopes (Nbb).
Nicholville stony fine sandy loam over till, 6 to 12 percent slopes (Nbc).
Salmon very fine sandy loam, 0 to 2 percent slopes (Sba).
Salmon very fine sandy loam, 2 to 6 percent slopes (Sbb).
Salmon very fine sandy loam, 6 to 12 percent slopes (Sbc).
Salmon stony very fine sandy loam over till, 0 to 2 percent slopes (Sca).
Salmon stony very fine sandy loam over till, 2 to 6 percent slopes (Scb).
Salmon stony very fine sandy loam over till, 6 to 12 percent slopes (Scc).

Fertility.—The soils of group 6 are naturally strongly acid. Liming is essential for good yields of crops in a dairy rotation. The soils are naturally low in phosphorus and potassium, and these elements must be added if good yields of corn, oats, and forage crops are to be obtained. The content of organic matter is medium.

Water-supplying capacity.—The capacity of the soils to supply water to crops is medium. Soil moisture is adequate for high yields in favorable years and for moderate yields in other years. The Nicholville soils remain wet a little longer in the spring than the well-drained Salmon soils. This difference may be important in seasons that are wetter than usual. The water-supplying capacity of the Nicholville soils in normal or dry seasons is somewhat higher than that of the Salmon soils. For this reason Nicholville soils will often produce higher crop yields than the Salmon soils in years that are drier than average.

Other features.—As indicated by the names, some of the soils in this group are somewhat stony. In some of the areas it is necessary to remove stones regularly if tilled crops are to be grown.

These soils are highly erodible, and erosion control practices are needed

Suitability for crops.—When properly limed and fertilized the soils of this group are well suited to all crops commonly grown in Franklin County. They are well suited to row crops, such as corn and potatoes, if adequate measures are taken to control erosion.

Cropping systems and erosion control practices.—The soils of group 6 are suited to comparatively short rotations. If row crops are grown once every 3 years, or oftener, special practices to control erosion are necessary, especially on slopes steeper than 2 percent.

Soil management group 7

Group 7 contains poorly drained clayey soils that have formed on fine-textured materials deposited in glacial lakes or seas. Permeability is slow in both the subsoil and the substratum. These soils are extensive, especially in the northwestern part of the county. They are used mainly for hay and pasture, which produce well if the soils are drained to some extent and properly fertilized. The group consists of the following mapping units:

Covington silty clay loam, 0 to 2 percent slopes (Cka).
Covington silty clay loam over till, 0 to 2 percent slopes (Cma).
Madalin silt loam, 0 to 2 percent slopes (Maa).
Madalin stony silt loam, 0 to 2 percent slopes (Mba).
Panton silty clay loam, 2 to 6 percent slopes (Paa).

Fertility.—The Covington and Madalin soils are neutral or only slightly acid, and free lime occurs in many places at a depth of about 3 feet. As a rule these soils do not need lime. The surface layer of the Panton soil is generally medium acid, but the subsoil is neutral.

The soils are naturally medium or low in phosphorus; yields will usually improve if additional phosphorus is applied. The supply of potassium is naturally high, and the addition of potash will not usually improve yields. The soils are high in organic matter. Because the soils are poorly drained, they may not supply enough nitrogen to crops until early in summer.

Water-supplying capacity.—The capacity of the soils to supply water to crops is high. Soil moisture is adequate for high yields in most years. It is seriously limited only in case of prolonged drought. These soils remain wet late in the spring because both internal drainage and surface drainage are slow. In most areas soil drainage can be improved considerably by bedding the soils and by providing open-ditch drains.

Other features.—Because of their fine texture, the soils of group 7 can be plowed only when moisture content is about right. They are generally plowed in the fall.

The Covington and Panton soil areas are generally in large uniform fields. To a lesser extent this is true of the Madalin soils.

Suitability for crops.—These soils are not well suited to corn or oats because they are too wet. If drained to some extent and properly fertilized, they are well suited to hay and pasture. Ladino clover, alsike clover, timothy, and redtop will grow well.

Cropping systems and erosion control practices.—If partly drained these soils are best suited to forage crops grown in comparatively long rotations. If they are used for this purpose, the risk of erosion is slight.

Soil management group 8

Group 8 contains well-drained loamy soils that have formed on high-lime glacial drift that was deposited by running water. They have moderately permeable surface soils and subsoils and rapidly permeable substrata. They are excellent for alfalfa because they are high in lime, are well drained, and have deep permeable substrata. About 2,000 acres of these soils occur in the northwestern part of the county. Their chief use is for crops. If properly fertilized they are productive of most of the crops grown in the county. The group consists of the following mapping units:

Kars gravelly sandy loam, 0 to 8 percent slopes (Kab).
Kars cobbly and stony loams, 0 to 8 percent slopes (Kbb).

Fertility.—These are high-lime soils in which free lime occurs naturally within 2 or 3 feet of the surface. It is seldom necessary to apply ground limestone. Good yields of corn, oats, and forage crops cannot be obtained, however, without adding phosphorus and potassium. The soils are naturally low in these plant nutrients. Potassium is especially important if alfalfa is to be grown. The organic-matter content of the soils is medium.

Water-supplying capacity.—The capacity of these soils to supply water to crops is medium. Soil moisture is adequate for high yields in favorable years and for moderate yields in most other years. Kars gravelly sandy loam has a somewhat lower moisture-supplying capacity than the Kars cobbly and stony loams and will therefore produce somewhat lower yields, especially in dry years.

Other features.—Kars cobbly and stony loams, 0 to 8 percent slopes, generally contains enough cobblestones and stones to interfere with, but not to prevent, cultivation. These soils sometimes occur in small areas surrounded by very stony Grenville soils. Such areas can seldom be cropped but are well suited to early spring pasture.

Suitability for crops.—When properly fertilized the soils of group 8 are well suited to corn for silage, oats, alfalfa, medium red clover, birdsfoot trefoil, and timothy.

Cropping systems and erosion control practices.—These soils are suited to short rotations but are often used in long rotations because of their suitability for alfalfa. If row crops are grown as often as once every 3 years, special practices to control erosion are needed on slopes steeper than 3 percent.

Soil management group 9

Group 9 contains loamy, somewhat poorly drained soils that have formed on silty lacustrine deposits and have an accumulation of clay in the subsoil. The surface and subsurface layers are moderately permeable; the subsoil and substratum are slowly permeable. About 2,000 acres of these soils, used mainly for crops and pasture, occur in the county. They produce good hay and pasture if properly fertilized. The group is made up of the following mapping units:

Rhinebeck silt loam, 0 to 2 percent slopes (Raa).
Rhinebeck silt loam, 2 to 6 percent slopes (Rab).

Fertility.—The surface layers of group 9 soils range from medium to slightly acid, so the need for lime may vary from one area to another. It is necessary to add lime to the medium acid soils to obtain good yields of crops grown in the rotations used on dairy farms. Phosphorus, in which the soils are naturally low, must be applied to obtain good yields. The clayey subsoil can supply large amounts of potassium to growing crops, but the silty surface soil is naturally low in that element. Consequently, good yields of most crops can be obtained without adding large amounts of potassium, but small applications are generally needed to start seedling plants. The organic-matter content is high. Because the soils remain cold and wet somewhat later than the better drained soils, the supply of nitrogen available to crops is commonly deficient early in the growing season.

Water-supplying capacity.—The capacity of these soils to supply water for crops is high. Soil moisture is adequate for high yields in most years, and only during prolonged droughts is the moisture supply seriously limited. These soils remain wet considerably later in the spring than better drained soils, such as those in groups 1 and 2, and this generally delays seeding. In drier than average years, however, they usually outyield the better drained soils because of their superior water-supplying capacity. The Rhinebeck soil on 2 to 6 percent slopes is slightly better drained than that on 0 to 2 percent slopes.

Other features.—The risk of erosion is high in comparison to that on other soils in Franklin County.

Suitability for crops.—The soils of group 9 are not well suited to corn, because they have restricted drainage. If properly limed and fertilized, they produce good yields of forage crops such as Ladino clover, alsike clover, birdsfoot trefoil, timothy, and redtop.

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Cropping systems and erosion control practices.—When these soils are used for forage crops grown in comparatively long rotations, there is little need for special practices to control erosion. If the soils are planted to row crops, tillage should be on the contour where feasible, especially on slopes that are greater than 2 percent.

Soil management group 10

Group 10 contains loamy, poorly drained soils that have formed on sandy parent material. More than 6,000 acres of these soils occur in the county, and more than half of this is cropped. Unless artificial drainage is provided, however, these soils are too wet for crops. If partly drained and properly limed and fertilized, they produce satisfactory yields of forage crops.

Permeability of the subsoil in the Swanton and Wallington soils is moderate. Permeability of the substratum is slow in the Swanton soil and in Wallington stony very fine sandy loam, over till, 0 to 2 percent slopes. The Walpole soil has a moderately permeable surface layer and rapidly permeable subsoil and substratum. This group consists of the following mapping units:

Swanton fine sandy loam, neutral variant, 0 to 3 percent slopes (Soa).
Wallington very fine sandy loam, 0 to 2 percent slopes (Waa).
Wallington stony very fine sandy loam, over till, 0 to 2 percent slopes (Wba).
Walpole fine sandy loam, neutral variant, 0 to 3 percent slopes (Wda).
Walpole loam, neutral variant, 0 to 3 percent slopes (Wea).

Fertility.—The Wallington soils are naturally strongly acid, and liming is necessary for forage crops. The Swanton and Walpole soils are slightly acid or neutral throughout, and lime is seldom needed. In all of these soils, phosphorus and potassium are naturally low and must be added if good yields of forage crops are to be obtained. The content of organic matter and ability to supply nitrogen are high. Because all of the soils remain cold and wet late in the growing season, however, nitrogen is commonly deficient until early in summer.

Water-supplying capacity.—The capacity of these soils to supply water to crops is high. Under natural conditions a water table is within 2 to 4 feet of the surface during most of the year. Soil drainage can be improved by digging open ditches or by bedding the soils. It is difficult, however, to stabilize the fine sandy subsoil that is exposed in drainage ditches. The Walpole soils will become droughty if overdrained.

Other features.—In many places Wallington stony very fine sandy loam, over till, 0 to 2 percent slopes, contains enough stones to interfere with, but not to prevent, plowing and other fieldwork.

Suitability for crops.—These soils are not well suited to corn or oats because they are poorly drained. If drained to some extent and properly limed and fertilized, they produce moderate yields of forage crops. Ladino clover, alsike clover, birdsfoot trefoil, timothy, and redtop will grow well.

Cropping systems and erosion control practices.—Special erosion control practices are seldom needed on these nearly level soils if they are used for forage crops grown in relatively long rotations.

Soil management group 11

Group 11 contains sandy, poorly drained soils that have formed on coarse-textured glacial deposits. Permeability of the surface soils and subsoils is rapid. The permeability of the substratum of the Coveytown soils and of the Walpole soils over till and over clay is slow. Their total area is about 30,000 acres. About three-fourths of this group is in crops or unimproved pasture, and the remainder is woodland. Unless they are drained artificially, the soils are not suited to crops. If partly drained and properly limed and fertilized, however, they produce fair yields of hay and pasture. This group consists of the following mapping units:

Coveytown cobbly loamy sand, 0 to 6 percent slopes (Cfa).
Coveytown gravelly loamy sand, 0 to 3 percent slopes (Cga).
Coveytown stony and very stony loamy sands, 0 to 6 percent slopes (Cha).
Walpole sandy loam, 0 to 6 percent slopes (Wca).
Walpole sandy loam, neutral variant, over till, 0 to 5 percent slopes (Wfa).
Walpole loamy sand, neutral variant, over clay, 0 to 3 percent slopes (Wga).
Walpole and Au Gres loamy sands, 0 to 6 percent slopes (Wha).
Walpole, neutral variant, and Au Gres loamy sands, 0 to 6 percent slopes (Wka).

Fertility.—Lime requirements vary in this group of soils. The mapping units that are neutral variants seldom need lime, but the two mapping units that consist of Walpole and Au Gres soils need lime to improve pastures or to grow hay. The Coveytown soils vary in their need for lime.

Group 11 soils are naturally low in phosphorus and potassium, and these elements must be added if forage crops are to be grown. The organic-matter content is medium to high. Because the soils remain cold and wet until comparatively late in the growing season, the amount of nitrogen available to crops is commonly deficient until early in summer.

Water-supplying capacity.—Under natural conditions these soils, although very sandy, have good water-supplying capacity because the water table is within 3 or 4 feet of the surface. If the water table is lowered too much by artificial means, the soils become droughty. These soils can be effectively drained by open ditches.

Other features.—Individual areas of Coveytown stony and very stony loamy sands may be either stony or very stony. In many areas both stony and very stony soils occur. The stony areas contain enough stones to interfere with, but not to prevent, cultivation. The very stony areas are not tilled because they are so stony that farm machinery cannot be used.

Suitability for crops.—Because of poor soil drainage, group 11 soils are not well suited to corn or oats. If drained to some extent and properly limed and fertilized they are suited to hay and pasture. Ladino clover, alsike clover, birdsfoot trefoil, timothy, and redtop are suitable forage plants.

Cropping systems and erosion control practices.—Special practices to control erosion are seldom needed on these soils. This is because they are best suited to, and used for, forage crops grown in comparatively long rotations, and because relief is nearly level or gently undulating.

Soil management group 12

Group 12 consists of sandy well-drained soils that have formed on very coarse textured water-deposited materials. Permeability is rapid in the surface soils, subsoils, and substrata. About 22,000 acres of these soils occur throughout the northern third of the county. Some of this acreage is cropped, but most of it is unimproved pasture, woodland, or idle land. Droughtiness and low natural fertility make the soils unproductive of most crops common in the area. The group consists of the following mapping units:

Adams and Wallace loamy sands, 0 to 3 percent slopes (Aaa).
Adams and Wallace loamy sands, 3 to 8 percent slopes (Aab).
Colton and Constable gravelly loamy sands, 0 to 3 percent slopes (Caa).
Colton and Constable gravelly loamy sands, 3 to 8 percent slopes (Cab).
Colton and Constable cobbly loamy sands, 3 to 8 percent slopes (Cbb).
Colton and Constable gravelly and cobbly loamy sands, 8 to 15 percent slopes (Ccc).
Trout River gravelly loamy sand, 0 to 3 percent slopes (Taa).
Trout River gravelly loamy sand, 3 to 8 percent slopes (Tab).
Trout River cobbly loamy sand, 0 to 3 percent slopes (Tba).
Trout River cobbly loamy sand, 3 to 8 percent slopes (Tbb).

Fertility.—These soils are naturally strongly acid. Lime is necessary if crops are to be grown in good rotations for dairy farms. The soils are naturally low in phosphorus and potassium, and these elements must be added to obtain good yields of corn, oats, and forage crops. The soils are low in organic matter.

On group 12 soils fertilizers should be supplied in small amounts, but at frequent intervals, because the soils are rapidly permeable and plant nutrients are leached out rapidly.

Water-supplying capacity.—The capacity of these soils to supply water for crops is low. Soil moisture is adequate for moderate yields in favorable years, and for low yields in most other years. The water supply is severely limited during even moderately droughty periods. The gravelly and cobbly Colton-Constable and Trout River soils are somewhat lower in water-supplying capacity than the Adams and Wallace soils.

Other features.—Because of their sandy texture and rapid permeability, the soils of this group dry out quickly and can be worked earlier in the spring than most of the other soils in the county. They are subject to severe erosion by wind and water when they do not have a plant cover.

Suitability for crops.—If properly limed and fertilized, this group of soils is suited to all the crops commonly grown in Franklin County. Crop yields will be low in most years, however, because the soils are droughty and are rapidly leached of soluble plant nutrients.

Cropping systems and erosion control practices.—If these soils must be cropped, they should be used for legume-grass hay grown in long rotations. If they are cropped or pastured, it is important that the fertility level be kept high enough to maintain a good plant cover. Otherwise, damaging erosion by wind or water is likely.

Soil management group 13

Group 13 consists of sandy, moderately well drained soils that have formed on coarse-textured glacial deposits.

Permeability is rapid in the surface soil and subsoil. Permeability of the substratum is slow in the Croghan soils that overlie clay or till. About 15,000 acres of the soils of this group occur in the northern third of the county. About half is cropped, and the remainder is idle land, unimproved pasture, or woodland. The general productivity of these soils is low because they are droughty and do not retain plant nutrients well. The group consists of the following mapping units:

Croghan loamy sand, 0 to 3 percent slopes (Cna).
Croghan loamy sand, 3 to 15 percent slopes (Cnb).
Croghan loamy sand over clay, 0 to 3 percent slopes (Coa).
Croghan fine sandy loam over clay, 0 to 6 percent slopes (Cpa).
Croghan sandy loam over till, 0 to 6 percent slopes (Cqb).
Duane gravelly sandy loam, 0 to 3 percent slopes (Daa).
Duane gravelly sandy loam, 3 to 8 percent slopes (Dab).
Duane cobbly sandy loam, 0 to 3 percent slopes (Dba).
Duane cobbly sandy loam, 3 to 8 percent slopes (Dbb).
Fahey gravelly loamy sand, 0 to 3 percent slopes (Faa).
Fahey gravelly loamy sand, 3 to 8 percent slopes (Fab).
Fahey cobbly and stony loamy sands, 0 to 3 percent slopes (Fba).
Fahey cobbly and stony loamy sands, 3 to 8 percent slopes (Fbb).

Fertility.—These soils are naturally strongly acid. Lime must be added to grow the common crops of dairy farms. Phosphorus and potassium, in which the soils are naturally low, must be applied for field crops. The soils are low to medium in organic matter. If productivity is to be maintained or improved, it is essential to maintain organic matter by growing legumes or by adding manure or nitrogenous fertilizers. Because these soils are sandy and rapidly permeable, plant nutrients are easily leached out. Therefore fertilizers should be applied in smaller amounts and at more frequent intervals than is common on the finer textured soils of the county. This is also true of applications of lime, once the initial lime requirement has been met.

Water-supplying capacity.—The capacity of the soils to supply water to crops is low. Soil moisture is adequate for moderate yields in favorable years, and for low yields in most other years. Soil moisture is generally severely limited during even moderate drought. Although the moisture-supplying capacity of the soils is low, it is somewhat better than that of the soils of group 12. This is reflected in somewhat higher yields.

Other features.—When these soils are not covered by vegetation, they are subject to severe wind and water erosion.

Suitability for crops.—When properly limed and fertilized, group 13 soils are suited to crops commonly grown on dairy farms. Because their requirements for lime and fertilizer are high, however, and crop yields are comparatively low, it may not be profitable to farm them.

Cropping systems and erosion control practices.—These soils are best suited to legume-grass hay grown in fairly long rotations. If used for that purpose, risk of erosion is slight, provided soil fertility is high enough to support a good plant cover.

Soil management group 14

Group 14 contains loamy soils that have formed on recent stream deposits. The Ondawa and Genesee soils of the group are well drained, and the Podunk and Eel soils are moderately well drained. Permeability of the surface soil and substratum is moderate. The soils occur in small areas along many streams in the county. Although subject to flooding, they are productive of most farm crops. The group consists of the following mapping units:

Ondawa and Genesee fine sandy loams, 0 to 2 percent slopes (Oaa).
Ondawa and Genesee fine sandy loams, high bottoms, 0 to 2 percent slopes (Oba).
Podunk and Eel fine sandy loams, 0 to 2 percent slopes (Pda).
Podunk and Eel fine sandy loams, high bottoms, 0 to 2 percent slopes (Pea).

Fertility.—These soils vary in lime requirements. The Genesee and Eel soils, which occur in the northwestern part of the county, are generally neutral or slightly acid throughout. The Ondawa and Podunk soils, in the southeastern part of the county, are medium to strongly acid. These soils are all naturally low in phosphorus. The need for potassium is generally medium in the Genesee and Eel soils and high in the Ondawa and Podunk soils. The organic-matter content is medium.

Water-supplying capacity.—The capacity of these soils to supply water to crops is medium. Soil moisture is adequate for high yields in favorable years, and for moderate yields in most other years. The soils are all subject to stream overflow. Soils on the lowest lying bottom lands are usually flooded at least once every 5 years. The higher bottom lands are flooded much less frequently.

Other features.—The size, shape, and location of these soil areas may limit their use. In many places the soils occur in small areas that are separated from adjacent cropland by steep slopes or swampy areas. They may be inaccessible to farm machinery.

Suitability for crops.—When properly limed and fertilized, these soils are suitable for most crops commonly grown in the county. Because of their location and susceptibility to flooding, many areas are used for permanent pasture.

Cropping systems and erosion control practices.—These soils are suited to relatively short rotations. They are, however, often used for legume-grass hay grown in long rotations, because they are subject to flooding and because it is so difficult to gain access to them with farm machinery. Risk of erosion is slight.

Soil management group 15

Group 15 contains poorly drained fine sandy loam soils that have formed on recent stream deposits. About 1,000 acres of the soils occur along streams in the northern third of the county. They are used mainly for permanent pasture or for long-term hay. Permeability of the surface soils and substratum is moderate. Productivity is limited by poor soil drainage and frequent flooding. The group consists of the following mapping units:

Rumney and Wayland fine sandy loams, 0 to 2 percent slopes (Rea).
Rumney and Wayland fine sandy loams, high bottoms, 0 to 2 percent slopes (Rfa).

Fertility.—The soils vary in lime requirements. The Wayland soils, in the northern and western parts of the county, are generally slightly acid to neutral throughout and seldom need lime. The Rumney soils are medium to strongly acid and need lime if forage crops are to be

grown successfully. The soils are naturally low in phosphorus. In the Wayland soils, the requirement for potassium is medium to low, and in the Rumney soils, it is high. The organic-matter content is high. Because the soils remain cold and wet late in the growing season, the amount of nitrogen available to crops is commonly deficient until early in summer.

Water-supplying capacity.—The capacity of these soils to supply water to crops is high. Soil moisture is adequate for good yields in most years. The soils remain wet much later in the spring than the soils of group 14. As a result seeding is later and crop yields are lower than on better drained soils.

Soils on the first bottoms are flooded almost every year, but the high bottom lands are flooded much less frequently.

Other features.—It is often difficult to gain access to these soils with farm machinery. Many small areas are separated from adjacent cropland by steep slopes or swampy areas.

Suitability for crops.—Because of poor soil drainage, these soils are not well suited to corn or small grains. Areas that are at least 5 acres in size and are accessible to farm machinery may be used for hay grown in long rotations.

Cropping systems and erosion control practices.—The soils of group 15 are best suited to forage crops grown in comparatively long rotations. Special practices to control erosion are rarely necessary.

Soil management group 16

Group 16 consists of very poorly drained soils that have formed on loamy or clayey materials. The soils are too wet for crops. About 11,000 acres of these soils, mostly woodland or permanent pasture, occur in the county. The group consists of the following mapping units:

Birdsall loam, 0 to 2 percent slopes (Bda).
Livingston silty clay loam, 0 to 2 percent slopes (Laa).
Livingston stony clay loam, 0 to 2 percent slopes (Lba).
Sun stony loam, 0 to 5 percent slopes (Sma).
Tughill and Dannemora stony very fine sandy loams, 0 to 3 percent slopes (Tca).

Very poor soil drainage is the main limitation to use of these soils for crops or pasture. Many small areas that are surrounded by better drained cropland could be drained. If drained these soils would be similar to soils of other management groups in use suitability and management needs. The similarities are as follows:

Birdsall, similar to the Wallington soils (group 10);
Livingston, similar to the Covington soils (group 7);
Sun, similar to the Massena soil (group 5);
Tughill and Dannemora, similar to Westbury and Dannemora soils (group 3).

Soil management group 17

Group 17 consists of very poorly drained soils that have formed on coarse-textured materials. About 9,000 acres of these soils occur in the county. Most of the acreage is woodland or permanent pasture. The group consists of the following soils:

Cook gravelly and cobbly loamy sands, 0 to 5 percent slopes (Cda).
Scarboro fine sandy loam, 0 to 3 percent slopes (Sea).
Scarboro loam, neutral variant, 0 to 3 percent slopes (Sfa).
Scarboro loam, neutral variant, over till or clay, 0 to 3 percent slopes (Sga).

Very poor soil drainage is the main limitation to use of these soils for crops or pasture. In many places the soils can be drained effectively by open ditches because their subsoils are rapidly permeable. If drained the Cook soil could be used and managed in the same way as the Coveytown soils of group 11, and the Scarboro soils in the same way as the Walpole soils of group 10.

Soil management group 18

Group 18 contains very stony, well drained to moderately well drained soils that have formed on stony glacial till in the northern third of the county. Except for the sandy Fahey soil, they are loamy and have moderate moisture-supplying capacity. These soils cover a total area of about 33,000 acres. They are used for unimproved permanent pasture or woodland. The group consists of the following:

Becket, Skerry and Hermon very stony sandy loams, 3 to 8 percent slopes (Bbb).
Becket, Skerry and Hermon very stony sandy loams, 8 to 25 percent slopes (Bbd).
Empeyville very stony very fine sandy loam, 0 to 8 percent slopes (Ebb).
Empeyville and Moira very stony very fine sandy loams, 8 to 25 percent slopes (Edc).
Fahey very stony loamy sand, 0 to 8 percent slopes (Fcb).
Grenville and Hogansburg very stony loams, 2 to 8 percent slopes (Gbb).
Grenville and Hogansburg very stony loams, 8 to 25 percent slopes (Gbc).
Moira very stony loam, 0 to 8 percent slopes (Mfb).
Parishville very stony loam, 2 to 8 percent slopes (Pcb).
Worth very stony fine sandy loam, 0 to 8 percent slopes (Wsb).
Worth very stony fine sandy loam, 8 to 25 percent slopes (Wsd).

These soils are too stony to be tilled by farm machinery. A large area is wooded. The soils are best suited to permanent pasture and woodland. They provide better early spring pasture than the soils of groups 19 and 21, because they are better drained. If cleared of stones and trees, their characteristics and suitability for use would be similar to those of soils of other management groups. The similarities would be as follows:

Becket, Skerry, and Hermon, similar to Becket and Skerry soils (group 1);
Empeyville and Moira, similar to Empeyville soils (group 1);
Fahey, similar to Fahey soils (group 13);
Grenville and Hogansburg, similar to Grenville and Hogansburg soils (group 4);
Parishville, similar to the Parishville soil (group 2);
Worth, similar to Worth soils (group 2).

Soil management group 19

Group 19 consists of very stony, loamy, poorly drained to somewhat poorly drained soils that have formed on stony glacial till. About 20,000 acres, in unimproved permanent pasture or woodland, occurs in the county. The group consists of the following soils:

Brayton very stony loam, 0 to 8 percent slopes (Bfb).
Massena very stony loam, 0 to 8 percent slopes (Mdb).
Ridgebury very stony sandy loam, 0 to 10 percent slopes (Rcb).

Westbury and Dannemora very stony very fine sandy loams, 0 to 8 percent slopes (Wna).
Westbury and Brayton very stony very fine sandy loams, 8 to 15 percent slopes (Woc).

Stoniness and restricted soil drainage are the main factors that limit the use of these soils. The soils are too stony to be worked by farm machinery and too wet to be suitable for most field crops. Trees grow on a large part. The best use for these soils is to leave them in permanent pasture or woodland. Because of their higher moisture-supplying capacity, they will usually provide better midsummer pasture than the soils of group 18. If cleared of stones, the soils would have use suitability similar to that of soils of the same series in groups 3 and 5.

Soil management group 20

Group 20 consists of well drained to moderately well drained soils that have developed on water-deposited materials. Their relief is sloping to moderately steep. The Adams and Wallace soils and the Colton and Constable soils are sandy and the Salmon and Nicholville soils are loamy. About 2,000 acres of these soils, used mainly as pasture or woodland, occur in the northern third of the county. The group consists of the following soils:

Adams and Wallace loamy sands, 12 to 25 percent slopes (Aad).
Colton and Constable gravelly and cobbly loamy sands, 15 to 25 percent slopes (Ccd).
Salmon and Nicholville stony very fine sandy loams, 12 to 20 percent slopes (Sdd).

Droughtiness and the risk of erosion are the main limitations to the use of these soils. They are best used as woodland.

Soil management group 21

Group 21 consists of very poorly drained soils. The Saco and Sloan soils are flooded frequently. They have developed from many different materials and vary in texture from sandy to clayey. About 28,000 acres of the soils occur in the agricultural part of the county. They are in unimproved pasture or used as woodland. The group consists of the following soils:

Cook stony and very stony loamy sands, 0 to 5 percent slopes (Cea).
Livingston very stony clay loam, 0 to 2 percent slopes (Lca).
Saco and Sloan soils, 0 to 2 percent slopes (Saa).
Sun very stony loam, 0 to 5 percent slopes (Sna).
Tughill and Dannemora very stony very fine sandy loams, 0 to 3 percent slopes (Tda).
Whitman very stony fine sandy loam, 0 to 8 percent slopes (Wpa)

Stoniness, very poor soil drainage, and frequency of flooding are the main limitations to use of the soils. Pasture improvement practices are seldom feasible because the soils are excessively stony or are frequently flooded. The soils are best used as woodland.

Soil management group 22

Group 22 consists of well-drained soils that occupy steep slopes. They have formed from many different parent materials and vary in texture from sandy to loamy. About 3,000 acres of these soils occur in the agricultural section of the county. They are used mainly as woodland or pasture, but some areas are idle. The group consists of the following soils:

Adams and Colton soils, 25 to 60 percent slopes (Ace).
Becket and Hermon soils, 25 to 60 percent slopes (Bce).
Salmon stony very fine sandy loam over till, 20 to 45 percent slopes (Sce).
Worth and Parishville soils, 25 to 60 percent slopes (Wte).

Steepness of slope is the most important factor that controls use of the soils in this group. The soils are best used as woodland, but they may provide some spring pasture.

Soil management group 23

Group 23 consists of sandy, well-drained soils that have formed on coarse-textured, water-deposited materials. Except that they are severely eroded, the soils resemble the Adams and Colton soils of groups 12 and 20. The surface soil has been lost from nearly all of the areas, and in many places part, or all, of the subsoil has been lost. The soils of this group total about 3,500 acres. Most of this is idle, but some is in woodland, and about a fifth is used for pasture or crops. The group consists of the following soils:

Adams and Colton soils, 3 to 8 percent slopes, severely eroded (Abb).
Adams and Colton soils, 8 to 25 percent slopes, severely eroded (Abd).

Unless these soils are stabilized by a plant cover, they will continue to erode. They are droughty and very low in fertility. They should be reforested.

Soil management group 24

Group 24 contains only the following mapping unit, which occurs on the broad sand plain in the northwestern part of the county:

Au Gres-Scarboro-Croghan association (Ada).

This mapping unit occurs only in relatively large areas of dense, second-growth woodland. It is unlikely that the soils will be used for agriculture in the foreseeable future. The unit is made up of sandy well drained to very poorly drained soils that total about 14,000 acres.

Soil management group 25

Group 25 soils consist of muck deposits that have gradually accumulated in wet depressions over a long period of years. Muck, deep, is more than 3 feet thick. Muck, shallow, ranges in thickness from 18 to 36 inches. About 2,000 acres of these organic soils occur in the northern part of Franklin County. Most of the areas are in unimproved permanent pasture or woodland. The following mapping units are in this group:

Muck, deep (Mga).
Muck, shallow (Mha).

Soil management group 26

Group 26 consists of mapping units in which bedrock outcrops or surface stones and boulders are so numerous that they completely dominate other soil characteristics as factors in possible agricultural use. About 900 acres of these mapping units are scattered throughout the northern third of the county. Individual areas are generally small. They are used mainly as woodland or unimproved pasture. The following mapping units are in this group:

Rockland, sandstone and granite (Rd).
Stony land, Hermon and Becket soils (Sh).
Stony land, Worth and Parishville soils (Sk).

Management Requirements and Practices

The general principles of soil management, as they apply to Franklin County, are discussed in the following pages, along with the factors that determine what management practices are required for the soils of the county.

Rotations and erosion control

Crop rotation is the first line of defense against soil deterioration. A well-planned, systematic rotation of crops that are well adapted to the soils provides many of the essentials of soil maintenance as a byproduct of good production.

Table 1 illustrates, for the soils of the county suitable for cropping, the relation between the crop rotation system and the need for special practices to maintain the organic-matter content of the soil and to control erosion. As the proportion of row crops in the rotation increases, more intensive maintenance practices become necessary.

The table also shows how the risk of erosion is affected by slope and by the texture of the soil. Assuming that the same rotation is followed, more intensive erosion control practices are required on slopes of 3 to 8 percent than on slopes of 0 to 3 percent. Soils of uniform texture are more readily eroded than those that consist of mixed sand, silt, and clay. For that reason, the soils are separated into two groups in table 1, according to whether they are of uniform or mixed texture.

Soils of groups 16 through 26 were not included in the table because they are not suited to tilled crops.

Erosion control.—Erosion control measures suitable for a particular location can be selected only after considering numerous factors, which differ from farm to farm and from field to field. The county agent or a Soil Conservation Service technician can be consulted for specific recommendations and technical help. As a general guide, the information in table 1 can be interpreted as follows: If the need for special practices is described as "low," either tilling on the contour or growing winter cover crops may be sufficient protection against erosion. If a "medium" need is indicated, both of these practices may be required and contour stripcropping may be advisable. If a "high" need is indicated, it may be necessary to construct diversion terraces as well as to practice stripcropping or contour cultivation.

Organic matter.—In planning a rotation, you must take into account the effect of each crop on the supply of organic matter in the soil. A row crop destroys, in one growing season, about 2 percent of the total reserve of organic matter. A small grain or similar close-growing crop destroys about half as much organic matter as a row crop. A grass-legume mixture for hay or pasture, or a grass crop that has been treated with nitrogen, will in 1 year restore to the soil approximately as much organic matter as a row crop destroyed in one season. In the second year, a sod crop is only about a fourth as effective as in its first year.

To maintain organic matter, you should plan a rotation that will establish, as nearly as possible, a balance between soil-depleting and soil-building crops. But a rotation that is ideal for maintaining organic matter may not include enough of the crops that are needed to make a farm pay. If you use a rotation that consists of 2 years of row crops and only 1 or 2 years of sod, you will need to make up the loss of organic matter by applying manure or large quantities of commercial fertilizer and growing cover crops. If you do not make up this loss, the supply of organic matter in the soil will gradually decline and it will become more difficult to keep your soils in good tilth. Some soils will be more seriously affected than others, but yields on most soils will decrease as the supply of organic matter is depleted.

About 12 to 15 tons of manure an acre will supply enough organic matter to replace what one row crop will use. A legume crop plowed under for green manure will give about the same results, but this practice usually means that 1 year's crop is lost. A winter cover crop that attains a good growth before being plowed under will restore some part of the organic matter used by row crops.

Using liberal amounts of commercial fertilizer is a way of partly offsetting a lack of manure. To get the maximum benefit from heavy applications of fertilizer, you should plant a cover crop to grow after the main crop has been harvested. Under this practice, a fertilizer that supplies 100 pounds of nitrogen can be as effective as 6 to 8 tons of manure. The cover crop utilizes fertilizer that is not used by the main crop and converts it into organic matter that can be plowed under.

Whenever possible a winter cover crop should be planted after a row crop. It protects the soil from erosion, uses fertilizer that would otherwise be leached out, and provides organic matter to be plowed under.

Lime and fertilizer

Crop rotation will not be effective as a means of maintaining organic matter and controlling erosion unless the soils support vigorous plant growth. General requirements for lime and for fertilizer are discussed in this section.

Lime.—Most of the crops commonly grown in Franklin County do best on soils that are nearly neutral or alkaline in reaction, that is, soils that have a pH of 6.5 or higher. The amount of lime needed to get this reaction depends partly on the natural reserve acidity of the soil and partly on previous liming practices. Exact requirements for specific soils can be determined by accurate and inexpensive soil tests. These tests should be made to find out how much lime the soil needs. This initial requirement may range from nothing to 6 or 7 tons an acre. After the initial requirement has been met, most soils of

TABLE 1.—*Alternative rotations and supporting practices to maintain organic matter and control erosion on soils suited to cropping*

[The terms "low," "medium," and "high," further explained in the text, indicate the comparative need for one or more erosion control practices such as winter cover crop, contour cultivation, stripcropping, or diversion terraces]

Soil management group	Suitable rotation or use	Practices to maintain organic matter	Relative need for special erosion control practices			
			0 to 3 percent slopes	3 to 8 percent slopes	8 to 15 percent slopes	15 to 25 percent slopes
SOILS CONSISTING OF MIXED SAND, SILT, AND CLAY						
Use for—groups 1, 2, 3, 4, 5, 8, 10, 11, 12, 13, 14, 15.	Row crops continuously.	Apply 12 to 15 tons manure per acre annually; use cover crop or green-manure crop if less manure is applied.	Medium	High	(1)	(1)
	Row crop, row crop, close-growing crop, sod.	Apply 20 tons manure per acre in 4 years, or use less manure and grow cover crops.	Low	High	(1)	(1)
	Row crop, close-growing crop, sod.	Apply 6 to 10 tons manure per acre in 3 years, or use less manure and grow cover crops.	Low	Medium	High	(1)
	Row crop, close-growing crop, sod, sod.	Other practices to maintain organic matter not needed if legumes dominate in sod; use nitrogen fertilizer if sod is grass.	Low or none.	Low	Medium	High.
	Row crop, close-growing crop, sod 3 or 4 years.	Same	None	None	Low	High.
SOILS IN WHICH THE PARTICLES ARE ALL ABOUT THE SAME SIZE						
Use for—groups 6, 7, 9.	Row crops continuously.	Apply 12 to 15 tons manure per acre annually; use cover crop or green-manure crop if less manure is applied.	Medium	(1)	(1)	(1)
	Row crop, row crop, close-growing crop, sod.	Apply 20 tons manure per acre in 4 years, or use less manure and grow cover crops.	Low	High	(1)	(1)
	Row crop, close-growing crop, sod.	Apply 6 to 10 tons manure per acre in 3 years, or use less manure and grow cover crops.	Low	Medium	High	(1)
	Row crop, close-growing crop, sod, sod.	Other practices to maintain organic matter not needed if legumes dominate in sod; use nitrogen fertilizer if sod is grass.	Low or none.	Low	High	(1)
	Row crop, close-growing crop, sod 3 or 4 years.	Same	None	Low or none.	Medium	(1)

[1] Rotation not suited to soils in this slope range.

Franklin County will need about a quarter of a ton of lime an acre each year to maintain a neutral reaction. This may be supplied by applying 1 ton per acre every 4 years or 1½ tons per acre every 6 years. "High-lime" soils, which naturally have free lime near the surface and have neutral subsoils, may need lime applied only infrequently or not at all.

It is not efficient to apply more than 4 tons of lime per acre in any 1 year, nor to use more than 2 tons as a surface application at any one time. If a soil needs more than 2 tons of lime, the best practice is to plow part of the lime down and then spread 1½ to 2 tons on the surface after plowing. The next best method is to apply 2 tons on the surface and harrow it in the upper 3 inches. A third choice is to apply up to 4 tons and plow it all down, but this method is not effective for the first crop grown. As an emergency measure, lime may be applied as a top-dressing after legumes are seeded. It is most important to provide, by one method or another, enough lime to obtain a neutral reaction, at least in the plow layer.

The best time to apply lime is just before planting legumes or other crops that will not tolerate soil acidity. In the rotations most commonly used in Franklin County, it is the legume-grass mixture for which lime is most essential. If the rotation includes a potato crop, less lime should be used, because potato scab becomes troublesome if the pH is higher than 6.0. Legumes can be grown in the same rotation with potatoes if one-quarter to three-quarters ton of ground limestone per acre is applied near the legume seed at planting time.

Nitrogen.—Almost all the nitrogen reserve in soils is held in the organic matter. The total organic-matter

content is therefore a good measure of the nitrogen reserve. But the nitrogen reserve is not, of itself, a good measure of the amount of nitrogen that will be released for crops, or of when it will be released. Nitrogen becomes available only as the organic matter decomposes. If the soil is cold and wet, decomposition is slow. Consequently, poorly drained soils, although they usually contain more organic matter than well-drained soils, do not release as much nitrogen early in the growing season while they are still cold and wet. On such soils applications of nitrogen fertilizer may be needed to get the crops started.

Little available nitrogen is carried over in the soil from one season to the next. It is either absorbed by plants or is rapidly washed away. Consequently, nitrogen fertilizer must be applied annually. The same practices that will maintain the organic-matter content of the soil will also maintain its nitrogen reserve.

Phosphorus.—The soils of Franklin County are low in phosphorus. Part of the reserve is held in the organic matter, but most of it is in the mineral part of the soil. The phosphorus is released too slowly to provide the amounts needed for good growth of crops. Commercial phosphorus is needed on almost all the soils of the county. Phosphorus, however, is not readily leached from the soil, so it is not necessary to apply it every year. Enough can be applied at one time to supply the needs of 4 or 5 years of crops, provided they are not intensively grown vegetable crops.

Because phosphorus stays in the soil a long time, past management is important in deciding how much phosphorus fertilizer is needed. It is a common practice on dairy farms to spread superphosphate on the stable floors at the rate of 1 or 2 pounds per cow per day. This fertilizer is mixed with the manure that is spread on the fields. If this practice has been followed for a long time and the manure has been liberally applied, phosphorus reserves may have accumulated to the extent that crops do not need additional phosphorus fertilizer. This surplus may last several years, but if application of phosphorus, alone or in manure, is discontinued, the soils will gradually become deficient in phosphorus again.

Very large reserves of phosphorus may accumulate in soils that have been fertilized for a long period with 100 pounds or more of phosphate per acre per year. On soils so fertilized, common field crops show no response if additional phosphorus is applied, but potato yields may be improved by adding additional phosphorus. The soils should be tested to determine whether there is a phosphorus reserve.

Except for soils that have already received large amounts, most of the soils need, each year, phosphorus equivalent to that in 125 to 175 pounds per acre of 20-percent superphosphate. This can be applied in manure or in commercial fertilizer. Corn, small grains, and hay do not respond to larger amounts of phosphorus, but as nitrogen fertilizers are used more extensively and yields become higher, the need for phosphorus may also become greater.

Potassium.—The soils of Franklin County range from very low to high in available potassium. The fine-textured soils of group 7 supply enough potassium so that adding potassium fertilizer is not of much benefit, except for the starter effects of small amounts placed near the seed. At the other extreme, the coarse-textured soils of groups 12 and 13 do not supply even enough potassium for moderate yields of the common crops. Some of the medium-textured soils release enough potassium for moderate yields of crops that do not require large amounts of potassium, but not enough for good yields, nor enough for crops that have high potassium requirements.

Potassium, like nitrogen, is rapidly washed out of the soil. Where it is needed, it should be applied annually in amounts sufficient to meet one season's requirements. Each ton of manure applied contains between 4 and 6 pounds of potassium, most of which is available to plants in the first year.

Artificial drainage

On much of the cropland in Franklin County, poor soil drainage seriously limits the productivity and suitability for crops. Some of the poorly drained soils occupy depressions where water accumulates. Others, which occupy long slopes, are kept wet by seepage water that accumulates above a slowly permeable layer that retards penetration of water. Unless artificial drainage is provided, the poorly drained soils are too wet for field crops in most years.

Most of the poorly drained soils that are surrounded by, or adjacent to, cropland have been drained artificially to some extent. Much of this drainage is indirect; road ditches have improved soil drainage over large areas, and tillage has improved surface drainage by removing small irregularities in the land surface. The estimated yields, shown in the table in the subsection, Estimates of Yields, are for these soils after they have been partially drained; they do not apply to poorly drained soils under natural conditions.

The technical problems of providing artificial drainage cannot be discussed in this report. A competent drainage engineer should determine whether or not a given field can be drained effectively. After the farmer has obtained this information and cost estimates, he must decide whether it will pay him to drain the field.

Estimates of Yields

Table 2 gives the long-term acre yields a farmer can expect from his soils under two levels of liming and fertilization. To supplement table 2, two levels of fertilization for a 5-year dairy-farm rotation are given in table 3. The different levels of management are discussed in the following subsections.

Levels of management

Columns A of table 2 give estimated yields under a level of management that is common on farms of Franklin County. The estimates are based on available records of yields. Columns B give estimated yields that could be obtained under a higher level of liming and fertilization than is common. The trend on many commercial dairy farms is toward this higher level. The estimates in the B columns were computed by using records of yields on experimental plots and yield records kept by farmers for certain soils, and by predicting, from knowledge of the properties of each soil, what response could be expected to improved management.

TABLE 2.—*Estimated long-term average acre yields of principal crops to be expected under two levels of liming and fertilization*

[See table 3 for amounts of lime, nitrogen, potassium, and phosphorus suggested for a 5-year dairy-farm rotation at A and B levels of fertilization and liming; table 1 shows alternative rotations and supporting practices needed to maintain organic matter and to control erosion; refer to the section, Soil Management Groups, for properties of the soils that affect their management.

[The terms "low," "medium," and "high" indicate relative year-to-year variations in yields caused principally by weather. For example, a dry or wet spring season will have less effect on yields of oats from a soil of the Worth series than on yields from a soil of the Massena series.

[Absence of yield estimate indicates crop is not commonly grown on the soil specified]

Map symbol	Soil	Corn for silage		Oats		Clover-grass		Grass		Yield variability	Relative need for	
		A	B	A	B	A	B	A	B		Lime	Potassium
		Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*			
Aaa	Adams and Wallace loamy sands, 0 to 3 percent slopes.	5	8	20	30	1.0	1.5	0.5	1.3	High	High	High.
Aab	Adams and Wallace loamy sands, 3 to 8 percent slopes.	5	8	20	30	1.0	1.5	.5	1.3	High	High	High.
Aad	Adams and Wallace loamy sands, 12 to 25 percent slopes.										High	High.
Abb	Adams and Colton soils, 3 to 8 percent slopes, severely eroded.										High	High.
Abd	Adams and Colton soils, 8 to 25 percent slopes, severely eroded.										High	High.
Ace	Adams and Colton soils, 25 to 60 percent slopes.										High	High.
Ada	Au Gres-Scarboro-Croghan association.										Variable	High.
Bab	Becket and Skerry stony sandy loams, 3 to 8 percent slopes.	8	11	32	45	1.8	2.5	.9	2.1	Medium	High	High.
Bac	Becket and Skerry stony sandy loams, 8 to 15 percent slopes.	7.2	10	29	41	1.6	2.2	.8	1.9	Medium	High	High.
Bbb	Becket, Skerry and Hermon very stony sandy loams, 3 to 8 percent slopes.										High	High.
Bbd	Becket, Skerry and Hermon very stony sandy loams, 8 to 25 percent slopes.										High	High.
Bce	Becket and Hermon soils, 25 to 60 percent slopes.										High	High.
Bda	Birdsall loam, 0 to 2 percent slopes										High	High.
Bea	Brayton stony loam, 0 to 3 percent slopes.	7	9	25	35	1.5	2.0	.8	2.0	High	Variable	High.
Beb	Brayton stony loam, 3 to 8 percent slopes.	7	9	25	35	1.5	2.0	.8	2.0	High	Variable	High.
Bfb	Brayton very stony loam, 0 to 8 percent slopes.										Variable	High.
Caa	Colton and Constable gravelly loamy sands, 0 to 3 percent slopes.	5	8	20	30	1.0	1.5	.5	1.3	High	High	High.
Cab	Colton and Constable gravelly loamy sands, 3 to 8 percent slopes.	5	8	20	30	1.0	1.5	.5	1.3	High	High	High.
Cbb	Colton and Constable cobbly loamy sands, 3 to 8 percent slopes.	5	8	20	30	1.0	1.5	.5	1.3	High	High	High.
Ccc	Colton and Constable gravelly and cobbly loamy sands, 8 to 15 percent slopes.										High	High.
Ccd	Colton and Constable gravelly and cobbly loamy sands, 15 to 25 percent slopes.										High	High.
Cda	Cook gravelly and cobbly loamy sands, 0 to 5 percent slopes.										Low	High.
Cea	Cook stony and very stony loamy sands, 0 to 5 percent slopes.										Low	High.
Cfa	Coveytown cobbly loamy sand, 0 to 6 percent slopes.	6	8	20	30	1.4	1.7	.7	1.7	High	Variable	High.
Cga	Coveytown gravelly loamy sand, 0 to 3 percent slopes.	6	8	20	30	1.4	1.7	.7	1.7	High	Variable	High.
Cha	Coveytown stony and very stony loamy sands, 0 to 6 percent slopes.	6	8	20	30	1.4	1.7	.7	1.7	High	Variable	High.
Cka	Covington silty clay loam, 0 to 2 percent slopes.			25	30	1.6	2.0	1.0	2.0	High	Low	Low.
Cma	Covington silty clay loam over till, 0 to 2 percent slopes.			25	30	1.6	2.0	1.0	2.0	High	Low	Low.
Cna	Croghan loamy sand, 0 to 3 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.

TABLE 2.—*Estimated long-term average acre yields of principal crops to be expected under two levels of liming and fertilization*—Continued

Map symbol	Soil	Corn for silage		Oats		Clover-grass		Grass		Yield variability	Relative need for	
		A	B	A	B	A	B	A	B		Lime	Potassium
		Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*			
Cnb	Croghan loamy sand, 3 to 15 percent slopes.	6	9	20	35	1.3	2.0	0.6	1.6	High	High	High.
Coa	Croghan loamy sand over clay, 0 to 3 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Cpa	Croghan fine sandy loam over clay, 0 to 6 percent slopes.	6.5	10	23	40	1.4	2.2	.7	1.8	Medium	High	High.
Cqb	Croghan sandy loam over till, 0 to 6 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Daa	Duane gravelly sandy loam, 0 to 3 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Dab	Duane gravelly sandy loam, 3 to 8 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Dba	Duane cobbly sandy loam, 0 to 3 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Dbb	Duane cobbly sandy loam, 3 to 8 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Eaa	Empeyville stony very fine sandy loam, 0 to 3 percent slopes.	9	12	35	50	1.8	2.5	.9	2.1	Medium	High	High.
Eab	Empeyville stony very fine sandy loam, 3 to 8 percent slopes.	9	12	35	50	1.8	2.5	.9	2.1	Medium	High	High.
Eac	Empeyville stony very fine sandy loam, 8 to 15 percent slopes.	8.1	10.8	32	45	1.6	2.3	.8	1.9	Medium	High	High.
Ebb	Empeyville very stony very fine sandy loam, 0 to 8 percent slopes.										High	High.
Ecd	Empeyville and Moira stony very fine sandy loams, 15 to 25 percent slopes.										High	High.
Edc	Empeyville and Moira very stony very fine sandy loams, 8 to 25 percent slopes.										High	High.
Faa	Fahey gravelly loamy sand, 0 to 3 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Fab	Fahey gravelly loamy sand, 3 to 8 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Fba	Fahey cobbly and stony loamy sands, 0 to 3 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Fbb	Fahey cobbly and stony loamy sands, 3 to 8 percent slopes.	6	9	20	35	1.3	2.0	.6	1.6	High	High	High.
Fcb	Fahey very stony loamy sand, 0 to 8 percent slopes.										High	High.
Gab	Grenville stony loam, 2 to 8 percent slopes.	10	13	40	55	2.0	2.8	1.0	2.2	Low	Low	High.
Gac	Grenville stony loam, 8 to 15 percent slopes.	9	11.7	36	50	1.8	2.5	.9	2.0	Low	Low	High.
Gbb	Grenville and Hogansburg very stony loams, 2 to 8 percent slopes.										Low	High.
Gbc	Grenville and Hogansburg very stony loams, 8 to 25 percent slopes.										Low	High.
Hac	Hermon stony sandy loam, 3 to 15 percent slopes.	8	11	32	45	1.6	2.3	.8	1.8	Medium	High	High.
Hbb	Hogansburg stony loam, 2 to 8 percent slopes.	10	13	40	55	2.0	2.8	1.0	2.2	Medium	Low	High.
Kab	Kars gravelly sandy loam, 0 to 8 percent slopes.	9	11	40	50	2.0	2.6	1.0	2.1	Medium	Low	High.
Kbb	Kars cobbly and stony loams, 0 to 8 percent slopes.	9	12	40	55	2.0	2.8	1.0	2.2	Low	Low	High.
Laa	Livingston silty clay loam, 0 to 2 percent slopes.										Low	Low.
Lba	Livingston stony clay loam, 0 to 2 percent slopes.										Low	Low.
Lca	Livingston very stony clay loam, 0 to 2 percent slopes.										Low	Low.
Maa	Madalin silt loam, 0 to 2 percent slopes.			25	30	1.6	2.0	1.0	2.0	High	Low	Low.
Mba	Madalin stony silt loam, 0 to 2 percent slopes.			25	30	1.6	2.0	1.0	2.0	High	Low	Low.
Mca	Massena stony loam, 0 to 4 percent slopes.	7	9	25	33	1.6	2.0	.8	2.0	High	Low	High.

TABLE 2.—*Estimated long-term average acre yields of principal crops to be expected under two levels of liming and fertilization*—Continued

Map symbol	Soil	Corn for silage		Oats		Clover-grass		Grass		Yield variability	Relative need for	
		A	B	A	B	A	B	A	B		Lime	Potassium
		Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*			
Mdb	Massena very stony loam, 0 to 8 percent slopes.										Low	High.
Mea	Moira stony loam, 0 to 3 percent slopes.	9	12	35	50	1.8	2.5	0.9	2.1	Medium	High	High.
Meb	Moira stony loam, 3 to 8 percent slopes.	9	12	35	50	1.8	2.5	.9	2.1	Medium	High	High.
Mec	Moira stony loam, 8 to 15 percent slopes.	8.1	10.8	32	45	1.6	2.3	.8	1.9	Medium	High	High.
Mfb	Moira very stony loam, 0 to 8 percent slopes.										High	High.
	Muck:											
Mga	Deep											
Mha	Shallow											
Naa	Nicholville fine sandy loam, 0 to 2 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Medium	High	High.
Nab	Nicholville fine sandy loam, 2 to 6 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Medium	High	High.
Nac	Nicholville fine sandy loam, 6 to 12 percent slopes.	9	11.7	36	50	1.6	2.3	.9	2.0	Medium	High	High.
Nba	Nicholville stony fine sandy loam over till, 0 to 2 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Medium	High	High.
Nbb	Nicholville stony fine sandy loam over till, 2 to 6 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Medium	High	High.
Nbc	Nicholville stony fine sandy loam over till, 6 to 12 percent slopes.	9	11.7	36	50	1.6	2.3	.9	2.0	Medium	High	High.
Oaa	Ondawa and Genesee fine sandy loams, 0 to 2 percent slopes.	9	12	35	50	1.8	2.5	.8	2.1	High	Variable	Variable.
Oba	Ondawa and Genesee fine sandy loams, high bottoms, 0 to 2 percent slopes.	9	12	35	50	1.8	2.5	.8	2.1	Medium	Variable	Variable.
Paa	Panton silty clay loam, 2 to 6 percent slopes.			28	35	1.6	2.2	1.0	2.0	High	Variable	Low.
Pbb	Parishville stony loam, 2 to 8 percent slopes.	9	12	35	50	1.8	2.5	.8	2.1	Low	High	High.
Pcb	Parishville very stony loam, 2 to 8 percent slopes.										High	High.
Pda	Podunk and Eel fine sandy loams, 0 to 2 percent slopes.	9	12	35	50	1.8	2.5	.8	2.1	High	Variable	Variable.
Pea	Podunk and Eel fine sandy loams, high bottoms, 0 to 2 percent slopes.	9	12	35	50	1.8	2.5	.8	2.1	Medium	Variable	Variable.
Raa	Rhinebeck silt loam, 0 to 2 percent slopes.	7	10	35	43	1.7	2.4	1.0	2.1	High	Variable	Medium.
Rab	Rhinebeck silt loam, 2 to 6 percent slopes.	8	11	40	50	1.8	2.5	1.0	2.1	High	Variable	Medium.
Rbb	Ridgebury stony sandy loam, 0 to 8 percent slopes.	6.3	8	22	31	1.4	1.8	.7	1.8	High	High	High.
Rcb	Ridgebury very stony sandy loam, 0 to 10 percent slopes.										High	High.
Rd	Rockland, sandstone and granite											
Rea	Rumney and Wayland fine sandy loams, 0 to 2 percent slopes.	6	8	20	30	1.6	2.0	.8	2.0	High	Variable	Variable.
Rfa	Rumney and Wayland fine sandy loams, high bottoms, 0 to 2 percent slopes.	7	9	22	33	1.8	2.2	.9	2.2	High	Variable	Variable.
Saa	Saco and Sloan soils, 0 to 2 percent slopes.										Variable	Variable.
Sba	Salmon very fine sandy loam, 0 to 2 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Low	High	High.
Sbb	Salmon very fine sandy loam, 2 to 6 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Low	High	High.
Sbc	Salmon very fine sandy loam, 6 to 12 percent slopes.	9	11.7	36	50	1.6	2.3	.9	2.0	Low	High	High.
Sca	Salmon stony very fine sandy loam over till, 0 to 2 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Low	High	High.
Scb	Salmon stony very fine sandy loam over till, 2 to 6 percent slopes.	10	13	40	55	1.8	2.6	1.0	2.2	Low	High	High.
Scc	Salmon stony very fine sandy loam over till, 6 to 12 percent slopes.	9	11.7	36	50	1.6	2.3	.9	2.0	Low	High	High.

TABLE 2.—*Estimated long-term average acre yields of principal crops to be expected under two levels of liming and fertilization*—Continued

Map symbol	Soil	Corn for silage		Oats		Clover-grass		Grass		Yield variability	Relative need for	
		A	B	A	B	A	B	A	B		Lime	Potassium
		Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*			
Sce	Salmon stony very fine sandy loam over till, 20 to 45 percent slopes.										High	High.
Sdd	Salmon and Nicholville stony very fine sandy loams, 12 to 20 percent slopes.										High	High.
Sea	Scarboro fine sandy loam, 0 to 3 percent slopes.										High	High.
Sfa	Scarboro loam, neutral variant, 0 to 3 percent slopes.										Low	High.
Sga	Scarboro loam, neutral variant, over till or clay, 0 to 3 percent slopes.										Low	High.
	Stony land:											
Sh	Hermon and Becket soils										High	High.
Sk	Worth and Parishville soils										High	High.
Sma	Sun stony loam, 0 to 5 percent slopes										Low	High.
Sna	Sun very stony loam, 0 to 5 percent slopes.										Low	High.
Soa	Swanton fine sandy loam, neutral variant, 0 to 3 percent slopes.	7	9	20	33	1.5	2.0	0.7	1.7	High	Low	High.
Taa	Trout River gravelly loamy sand, 0 to 3 percent slopes.	6	9	30	40	1.5	2.0	.7	1.8	High	High	High.
Tab	Trout River gravelly loamy sand, 3 to 8 percent slopes.	6	9	30	40	1.5	2.0	.7	1.8	High	High	High.
Tba	Trout River cobbly loamy sand, 0 to 3 percent slopes.	5.5	8.5	25	35	1.4	1.8	.6	1.6	High	High	High.
Tbb	Trout River cobbly loamy sand, 3 to 8 percent slopes.	5.5	8.5	25	35	1.4	1.8	.6	1.6	High	High	High.
Tca	Tughill and Dannemora stony very fine sandy loams, 0 to 3 percent slopes.										High	High.
Tda	Tughill and Dannemora very stony very fine sandy loams, 0 to 3 percent slopes.										High	High.
Waa	Wallington very fine sandy loam, 0 to 2 percent slopes.	7	9	20	33	1.5	2.0	.7	1.7	High	High	High.
Wba	Wallington stony very fine sandy loam, over till, 0 to 2 percent slopes.	7	9	20	33	1.5	2.0	.7	1.7	High	High	High.
Wca	Walpole sandy loam, 0 to 6 percent slopes.	6	8	20	30	1.2	1.7	.7	1.7	High	High	High.
Wda	Walpole fine sandy loam, neutral variant, 0 to 3 percent slopes.	7	9	20	33	1.5	2.0	.7	1.7	High	Low	High.
Wea	Walpole loam, neutral variant, 0 to 3 percent slopes.	7	9	20	33	1.5	2.0	.7	1.7	High	Low	High.
Wfa	Walpole sandy loam, neutral variant, over till, 0 to 5 percent slopes.	6	8	20	30	1.4	1.7	.7	1.7	High	Low	High.
Wga	Walpole loamy sand, neutral variant, over clay, 0 to 3 percent slopes.	6	8	20	30	1.4	1.7	.7	1.7	High	Low	High.
Wha	Walpole and Au Gres loamy sands, 0 to 6 percent slopes.	6	8	20	30	1.2	1.7	.7	1.7	High	High	High.
Wka	Walpole, neutral variant, and Au Gres loamy sands, 0 to 6 percent slopes.	6	8	20	30	1.4	1.7	.7	1.7	High	Variable	High
Wma	Westbury and Dannemora stony very fine sandy loams, 0 to 3 percent slopes.	7	9	25	35	1.5	2.0	.8	2.0	High	High	High.
Wmb	Westbury and Dannemora stony very fine sandy loams, 3 to 8 percent slopes.	7	9	25	35	1.5	2.0	.8	2.0	High	High	High.
Wna	Westbury and Dannemora very stony very fine sandy loams, 0 to 8 percent slopes.										High	High.
Woc	Westbury and Brayton very stony very fine sandy loams, 8 to 15 percent slopes.										High	High.
Wpa	Whitman very stony fine sandy loam, 0 to 8 percent slopes.										High	High.
Wqa	Worth stony fine sandy loam, 0 to 3 percent slopes.	9	12	35	50	1.8	2.5	.8	2.1	Low	High	High.
Wqb	Worth stony fine sandy loam, 3 to 8 percent slopes.	9	12	35	50	1.8	2.5	.8	2.1	Low	High	High.

TABLE 2.—*Estimated long-term average acre yields of principal crops to be expected under two levels of liming and fertilization*—Continued

Map symbol	Soil	Corn for silage		Oats		Clover-grass		Grass		Yield variability	Relative need for	
		A	B	A	B	A	B	A	B		Lime	Potassium
		Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*			
Wqc	Worth stony fine sandy loam, 8 to 15 percent slopes.	8. 1	10. 8	32	45	1. 6	2. 3	0. 7	1. 9	Low	High	High.
Wsb	Worth very stony fine sandy loam, 0 to 8 percent slopes.										High	High.
Wsd	Worth very stony fine sandy loam, 8 to 25 percent slopes.										High	High.
Wte	Worth and Parishville soils, 25 to 60 percent slopes.										High	High.

TABLE 3.—*Two levels of fertilization for a 5-year dairy-farm rotation*

[Rates in columns A are needed to get yields in columns A of table 2, those in columns B are needed to get yields in columns B.

[For columns A, plow layer of naturally acid soils receives some lime, but not enough to maintain a pH of 6.0; for columns B, naturally acid soils receive lime enough to bring plow layer to pH of 6.5]

Rotation	Pounds per acre available—					
	Nitrogen (N)		Potassium (K_2O)		Phosphorus (P_2O_5)	
	A	B	A[1]	B	A	B
Corn for silage	20–30	40–50	20–30	40–50		
Oats	20–25	30–35	20–30	40–50		
Clover-grass hay[2]	[3] 20–30	0	[3] 25–35	50–60	[4] 125–175	[4] 125–175
Grass hay	0	0	0	0		
Grass hay[5]	0	40–50	0	40–50		

[1] For soils of management groups 7 and 9, rates in this column are for yields in columns B of table 2.

[2] Seeding mixture: 6 pounds medium red clover, 2 pounds alsike clover, 1 pound Ladino clover, 2 pounds alfalfa, and 6 pounds timothy.

[3] Nitrogen and potassium from topdressing of manure, assuming a ton of manure supplies 4 pounds nitrogen, 5 pounds phosphorus, and 5 pounds potassium.

[4] Averages 25 to 35 pounds per acre per year for the rotation; all phosphorus needed for the rotation can be applied at one time.

[5] Yields of grass hay in table 2 are for third-year hay.

Basis for estimates

Yield estimates are based on information obtained from the following sources: (1) Records of measured yields obtained by conducting short-term experiments on specific soils; (2) records of yields and soil management practices reported by farmers for crops on specific soils; (3) observations of crops and interviews with farmers during the course of the survey; (4) knowledge of soil properties that are known to affect crop growth; and (5) average yield figures, derived from agricultural census data, for all soils and all management practices.

Capability Groups of Soils

Land-capability classification is widely used as a guide in choosing uses of land and combinations of management and conservation practices to fit particular kinds of soils. The classification is a practical grouping of soils. The soils are placed in eight classes according to their general, all-around suitability for crops, grazing, forestry, and wildlife, and the risks of erosion or other damage. Each soil is placed in one of these eight general classes after consideration of the number of uses that can be made of it; the things that must be done, that is, the inputs required, for each type of use; the limitations of soil and climate; and the risks of erosion or other damage whenever cover becomes thin or is removed. Soils in one class offer, in a broad way, a similar range in choice of use and are subject to about the same degree of natural limitations. Often, however, one class contains different kinds of soils, and the characteristics that limit their use are of different kinds, although approximately of the same degree.

The eight general classes range from class I, which includes the soils that are nearly level and favorable in all characteristics, to class VIII, which includes soils that produce little or no useful vegetation. Soils in class I are nearly level, easy to farm, and have no serious limitations for cultivation or other uses. They are good soils for crops, grazing, or forestry, and the farmer usually can choose among several types of use and systems of cropping.

A soil is placed in class II if it is a little more limited in any way than the soils in class I, and its limitations, all taken together, are of moderate degree if it is used as cropland. Gently sloping areas of the best soils, for example, are in class II because of the risk of runoff and erosion. Soils that are slightly wet, or others that are somewhat sandy, have dense clay subsoils, are located in a climate not dependable enough for the usual crops, or have other moderate limitations, are all in class II. Obviously class II and most of the other classes can contain different kinds of soils. The class alone suggests general suitability for cultivation or other uses, but it must be used with other information to furnish a guide to choice of suitable crops, cropping systems, management practices, or conservation needs for the particular soil.

Class III contains the soils that are severely limited for cropland uses, but which with suitable treatment can be

used regularly in a practical cropping system. Some are moderately sloping and require control of erosion, some are wet and require drainage, and some have other natural limitations.

Class IV contains soils that, because of the risk of erosion or some other reason, cannot be used for a regular cropping system but which can be used for tillage part of the time or with special precautions. They are more limited than the soils of class III because of steeper slopes, more stones, less favorable climate, or some other feature or combination of features.

Soils so limited by their characteristics that cultivation is not practicable, that require extreme inputs, or that cause high risks of erosion are placed in classes V, VI, VII or VIII. Class V is not used in this county. Soils placed in class VI are more limited in one or more features than those in class IV, but they will produce forage, orchard crops, or forest products. Some of them can be cultivated enough to prepare them for longtime forage or orchard crops or for forest trees. Soils in class VII are more limited than those in class VI. Generally they must be managed by harvesting vegetation that grows as a result of natural or partly controlled succession, and the choices in management are fewer, production is less, or risk of erosion is greater than on the soils in class VI.

Class VIII consists of soils so severely limited that they produce little useful vegetation. They may provide attractive scenery or may be parts of valuable watersheds. Some may have value for wildlife.

SUBCLASSES: Each of the eight general classes contains soils that have limitations and management problems of about the same degree. The soils, and therefore the limitations within one class, however, can be of different kinds. Subclasses are recognized according to the dominant kind of limiting soil characteristics. As many as four subclasses may be recognized, although usually not all of them will occur in one area the size of a county. Subclasses are designated by the class number and a small letter, such as IIe or IIw. The four possible subclasses are those having as the dominant limitation the danger of erosion if cover is not maintained (e); excess water (w); shallow, droughty, or unusually infertile soil (s); or unusually hazardous climate (c).

The capability classes and subclasses in Franklin County are defined in the following list.

Capability Classes and Subclasses

Class I.—Deep, well-drained, nearly level soils. Suitable for intensive long-time use under cultivation if good farming practices are followed.

Class II.—Soils that can be cultivated with only moderate risk of erosion or that have other moderate limitations.
- IIe: Gently sloping soils subject to moderate risk of erosion under cultivation.
- IIw: Soils with moderately impeded natural drainage that makes them seasonally wet and restricts their suitability for some sensitive crops.
- IIs: Gravelly or cobbly somewhat droughty soils, gently sloping.

Class III.—Soils that can be cultivated in a regular cropping system with moderately severe risks of erosion or that have other moderately severe limitations.
- IIIe: Moderately sloping soils subject to erosion if not protected.
- IIIw: Nearly level to moderately sloping soils with imperfect or poor natural drainage.
- IIIs: Nearly level or gently sloping sandy droughty soils.

Class IV.—Soils severely limited or subject to high risks of soil damage when used for cultivation. Can be cultivated with special management.
- IVe: Strongly sloping soils that are otherwise favorable for cultivation.
- IVw: Poorly drained or wet soils that are difficult to manage for crops.
- IVs: Cobbly droughty soils that are suitable for some cultivation if they receive special management.

Class VI.—Soils not suitable for cultivation because of steep slopes or stoniness. Suitable for pasture or woodland if they receive suitable management.
- VIe: Steep stony soils underlain by silts and fine sands.
- VIs: Gently sloping to moderately steep, stony or very stony soils.

Class VII.—Soils with serious hazards or limitations when used for pasture or woodland.
- VIIs: Steep, severely eroded or very stony soils.
- VIIw: Wet soils that are severely limited if used as pasture or woodland.

Class VIII.—Soils not suitable for cropland, pasture, or woodland.
- VIIIw: Swampy soils or flood plains.
- VIIIs: Rockland, sandstone, and granite.

Classification of Each Soil Mapping Unit

The soils of the county are listed by capability subclasses as follows:

	Capability subclass
Adams and Wallace loamy sands, 0 to 3 percent slopes (Aaa)	IIIs.
Adams and Wallace loamy sands, 3 to 8 percent slopes (Aab)	IIIs.
Adams and Wallace loamy sands, 12 to 25 percent slopes (Aad):	
12 to 15 percent slopes	IIIe.
15 to 25 percent slopes	VIIs.
Adams and Colton soils, 3 to 8 percent slopes, severely eroded (Abb)	VIIs.
Adams and Colton soils, 8 to 25 percent slopes, severely eroded (Abd)	VIIs.
Adams and Colton soils, 25 to 60 percent slopes (Ace)	VIIs.
Au Gres-Scarboro-Croghan association (Ada):	
Au Gres	IVw.
Scarboro	IVw.
Croghan	IIIw.
Becket and Skerry stony sandy loams, 3 to 8 percent slopes (Bab)	IIe.
Becket and Skerry stony sandy loams, 8 to 15 percent slopes (Bac)	IIIe.
Becket, Skerry and Hermon very stony sandy loams, 3 to 8 percent slopes (Bbb)	VIs.
Becket, Skerry and Hermon very stony sandy loams, 8 to 25 percent slopes (Bbd)	VIs.
Becket and Hermon soils, 25 to 60 percent slopes (Bce)	VIIs.
Birdsall loam, 0 to 2 percent slopes (Bda)	IIIw.
Brayton stony loam, 0 to 3 percent slopes (Bea)	IIIw.
Brayton stony loam, 3 to 8 percent slopes (Beb)	IIIe.
Brayton very stony loam, 0 to 8 percent slopes (Bfb)	VIs.
Colton and Constable gravelly loamy sands, 0 to 3 percent slopes (Caa)	IIIs.

	Capability class and subclass
Colton and Constable gravelly loamy sands, 3 to 8 percent slopes (Cab)	IIIs.
Colton and Constable cobbly loamy sands, 3 to 8 percent slopes (Cbb)	IVs.
Colton and Constable gravelly and cobbly loamy sands, 8 to 15 percent slopes (Ccc):	
Gravelly areas	IIIe.
Cobbly areas	IVs.
Severely eroded inclusions	VIIs.
Colton and Constable gravelly and cobbly loamy sands, 15 to 25 percent slopes (Ccd)	VIIs.
Cook gravelly and cobbly loamy sands, 0 to 5 percent slopes (Cda)	IVw.
Cook stony and very stony loamy sands, 0 to 5 percent slopes (Cea):	
Stony areas	IVw.
Very stony areas	VIIw.
Coveytown cobbly loamy sand, 0 to 6 percent slopes (Cfa)	IVw.
Coveytown gravelly loamy sand, 0 to 3 percent slopes (Cga)	IVw.
Coveytown stony and very stony loamy sands, 0 to 6 percent slopes (Cha):	
Stony areas	IVw.
Very stony areas	VIs.
Covington silty clay loam, 0 to 2 percent slopes (Cka)	IVw.
Covington silty clay loam over till, 0 to 2 percent slopes (Cma)	IVw.
Croghan loamy sand, 0 to 3 percent slopes (Cna)	IIIw.
Croghan loamy sand, 3 to 15 percent slopes (Cnb)	IIIw.
Croghan loamy sand over clay, 0 to 3 percent slopes (Coa)	IIIw.
Croghan fine sandy loam over clay, 0 to 6 percent slopes (Cpa):	
0 to 3 percent slopes	IIw.
3 to 8 percent slopes	IIe.
Croghan sandy loam over till, 0 to 6 percent slopes (Cqb)	IIIw.
Duane gravelly sandy loam, 0 to 3 percent slopes (Daa)	IIIw.
Duane gravelly sandy loam, 3 to 8 percent slopes (Dab)	IIIw.
Duane cobbly sandy loam, 0 to 3 percent slopes (Dba)	IIIw.
Duane cobbly sandy loam, 3 to 8 percent slopes (Dbb)	IIIw.
Empeyville stony very fine sandy loam, 0 to 3 percent slopes (Eaa)	IIw.
Empeyville stony very fine sandy loam, 3 to 8 percent slopes (Eab)	IIe.
Empeyville stony very fine sandy loam, 8 to 15 precent slopes (Eac):	
Moderately eroded areas	IIIe.
Severely eroded inclusion	IVe.
Empeyville very stony very fine sandy loam, 0 to 8 percent slopes (Ebb)	VIs.
Empeyville and Moira stony very fine sandy loams, 15 to 25 percent slopes (Ecd)	IVe.
Severely eroded inclusions	VIe.
Empeyville and Moira very stony very fine sandy loams, 8 to 25 percent slopes (Edc)	VIs.
Fahey gravelly loamy sand, 0 to 3 percent slopes (Faa)	IIIw.
Fahey gravelly loamy sand, 3 to 8 percent slopes (Fab)	IIIw
Fahey cobbly and stony loamy sands, 0 to 3 percent slopes (Fba)	IIIw.
Fahey cobbly and stony loamy sands, 3 to 8 percent slopes (Fbb)	IIIw.
Fahey very stony loamy sand, 0 to 8 percent slopes (Fcb)	VIs.
Grenville stony loam, 2 to 8 percent slopes (Gab)	IIe.
Grenville stony loam, 8 to 15 percent slopes (Gac)	IIIe.
Inclusions of areas with 15 to 25 percent slopes	IVe.
Grenville and Hogansburg very stony loams, 2 to 8 percent slopes (Gbb)	VIs.
Grenville and Hogansburg very stony loams, 8 to 25 percent slopes (Gbc)	VIs.
Hermon stony sandy loam, 3 to 15 percent slopes (Hac):	
3 to 8 percent slopes	IIe.
8 to 15 percent slopes	IIIe.
Hogansburg stony loam, 2 to 8 percent slopes (Hbb)	IIe.
Inclusions of areas with—	
0 to 3 percent slopes	IIw.
8 to 15 percent slopes	IIIe.
Kars gravelly sandy loam, 0 to 8 percent slopes (Kab):	
0 to 3 percent slopes	IIs.
3 to 8 percent slopes	IIe.
Inclusions of 8 to 15 percent slopes	IIIe.
Kars cobbly and stony loams, 0 to 8 percent slopes (Kbb):	
0 to 3 percent slopes	IIs.
3 to 8 percent slopes	IIe.
Inclusion of areas with—	
8 to 15 percent slopes	IIIe.
15 to 25 percent slopes	IVe.
Livingston silty clay loam, 0 to 2 percent slopes (Laa)	IVw.
Livingston stony clay loam 0 to 2 percent slopes (Lba)	IVw.
Livingston very stony clay loam, 0 to 2 percent slopes (Lca)	VIIw.
Madalin silt loam, 0 to 2 percent slopes (Maa)	IVw.
Madalin stony silt loam, 0 to 2 percent slopes (Mba)	IVw.
Inclusions of very stony areas	VIs.
Massena stony loam, 0 to 4 percent slopes (Mca)	IIIw.
Massena very stony loam, 0 to 8 percent slopes (Mdb)	VIs.
Moira stony loam, 0 to 3 percent slopes (Mea)	IIw.
Moira stony loam, 3 to 8 percent slopes (Meb)	IIe.
Moira stony loam, 8 to 15 percent slopes (Mec)	IIIe.
Severely eroded inclusion	IVe.
Moira very stony loam, 0 to 8 percent slopes (Mfb)	VIs.
Muck, deep (Mga)	VIIw.
If drained or feasible to drain	IIIw.
Muck, shallow (Mha)	VIIIw.
Nicholville fine sandy loam, 0 to 2 percent slopes (Naa)	IIw.
Nicholville fine sandy loam, 2 to 6 percent slopes (Nab)	IIe.
Nicholville fine sandy loam, 6 to 12 percent slopes (Nac)	IIIe.
Severely eroded inclusion	IVe.
Nicholville stony fine sandy loam over till, 0 to 2 percent slopes (Nba)	IIw.
Nicholville stony fine sandy loam over till, 2 to 6 percent slopes (Nbb)	IIe.
Nicholville stony fine sandy loam over till, 6 to 12 percent slopes (Nbc)	IIIe.
Severely eroded inclusion	IVe.
Ondawa and Genesee fine sandy loams, 0 to 2 percent slopes (Oaa)	IIw.
Ondawa and Genesee fine sandy loams, high bottoms, 0 to 2 percent slopes (Oba)	I.
Inclusion of areas with 3 to 8 percent slopes	IIe.
Panton silty clay loam, 2 to 6 percent slopes (Paa)	IVw.
Parishville stony loam, 2 to 8 percent slopes (Pbb)	IIe.
Inclusions of areas with—	
8 to 15 percent slopes	IIIe.
15 to 25 percent slopes and 8 to 15 percent slopes, severely eroded	IVe.
15 to 25 percent slopes, severely eroded	VIe.
Parishville very stony loam, 2 to 8 percent slopes (Pcb)	VIs.
Podunk and Eel fine sandy loams, 0 to 2 percent slopes (Pda)	IIw.
Podunk and Eel fine sandy loams, high bottoms, 0 to 2 percent slopes (Pea)	IIw.
Inclusions of areas with 3 to 8 percent slopes	IIe.
Rhinebeck silt loam, 0 to 2 percent slopes (Raa)	IIw.
Rhinebeck silt loam, 2 to 6 percent slopes (Rab)	IIe.
Ridgebury stony sandy loam, 0 to 8 percent slopes (Rbb):	
0 to 3 percent slopes	IIIw.
3 to 8 percent slopes	IIIe.
Ridgebury very stony sandy loam, 0 to 10 percent slopes (Rcb)	VIs.
Rockland, sandstone and granite (Rd)	VIIIs.
Rumney and Wayland fine sandy loams, 0 to 2 percent slopes (Rea)	IVw.
Rumney and Wayland fine sandy loams, high bottoms 0 to 2 percent slopes (Rfa)	IIIw.
Saco and Sloan soils, 0 to 2 percent slopes (Saa)	VIIIw.
Salmon very fine sandy loam, 0 to 2 percent slopes (Sba)	I.

	Capability class and subclass
Salmon very fine sandy loam, 2 to 6 percent slopes (Sbb)	IIe.
Salmon very fine sandy loam, 6 to 12 percent slopes (Sbc)	IIIe.
Severely eroded inclusion	IVe.
Salmon stony very fine sandy loam over till, 0 to 2 percent slopes (Sca)	I.
Salmon stony very fine sandy loam over till, 2 to 6 percent slopes (Scb)	IIe.
Salmon stony very fine sandy loam over till, 6 to 12 percent slopes (Scc)	IIIe.
Severely eroded inclusion	IVe.
Salmon stony very fine sandy loam over till, 20 to 45 percent slopes (Sce):	
20 to 30 percent slopes	VIe.
Slopes over 30 percent and severely eroded inclusion	VIIe.
Salmon and Nicholville stony very fine sandy loams, 12 to 20 percent slopes (Sdd)	IVe.
Scarboro fine sandy loam, 0 to 3 percent slopes (Sea)	IVw.
Scarboro loam, neutral variant, 0 to 3 percent slopes (Sfa)	IIIw.
Scarboro loam, neutral variant, over till or clay, 0 to 3 percent slopes (Sga)	IIIw.
Stony land, Hermon and Becket soils (Sh)	VIIs.
Stony land, Worth and Parishville soils (Sk)	VIIs.
Sun stony loam, 0 to 5 percent slopes (Sma)	IVw.
Sun very stony loam, 0 to 5 percent slopes (Sna)	VIIw.
Swanton fine sandy loam, neutral variant, 0 to 3 percent slopes (Soa)	IIIw.
Trout River gravelly loamy sand, 0 to 3 percent slopes (Taa)	IIIs.
Trout River gravelly loamy sand, 3 to 8 percent slopes (Tab)	IIIs.
Inclusions of areas with 8 to 15 percent slopes	IIIe.
Severely eroded inclusions	VIIs.
Trout River cobbly loamy sand, 0 to 3 percent slopes (Tba)	IVs.
Trout River cobbly loamy sand, 3 to 8 percent slopes (Tbb)	IVs.
Tughill and Dannemora stony very fine sandy loams, 0 to 3 percent slopes (Tca)	IVw.
Tughill and Dannemora very stony very fine sandy loams, 0 to 3 percent slopes (Tda)	VIIw.
Wallington very fine sandy loam, 0 to 2 percent slopes (Waa)	IIIw.
Wallington stony very fine sandy loam, over till, 0 to 2 percent slopes (Wba)	IIIw.
Walpole sandy loam, 0 to 6 percent slopes (Wca)	IVw.
Walpole fine sandy loam, neutral variant, 0 to 3 percent slopes (Wda)	IIIw.
Walpole loam, neutral variant, 0 to 3 percent slopes (Wea)	IIIw.
Walpole sandy loam, neutral variant, over till, 0 to 5 percent slopes (Wfa)	IVw.
Walpole loamy sand, neutral variant, over clay, 0 to 3 percent slopes (Wga)	IVw.
Walpole and Au Gres loamy sands, 0 to 6 percent slopes (Wha)	IVw.
Walpole, neutral variant, and Au Gres loamy sands, 0 to 6 percent slopes (Wka)	IVw.
Westbury and Dannemora stony very fine sandy loams, 0 to 3 percent slopes (Wma)	IIIw.
Westbury and Dannemora stony very fine sandy loams, 3 to 8 percent slopes (Wmb)	IIIe.
Westbury and Dannemora very stony very fine sandy loams, 0 to 8 percent slopes (Wna)	VIs.
Westbury and Brayton very stony very fine sandy loams, 8 to 15 percent slopes (Woc)	VIs.
Whitman very stony fine sandy loam, 0 to 8 percent slopes (Wpa)	VIIw.
Worth stony fine sandy loam, 0 to 3 percent slopes (Wqa)	I.
Worth stony fine sandy loam, 3 to 8 percent slopes (Wqb)	IIe.
Shallow phase inclusions	IVs or VIs.
Worth stony fine sandy loam, 8 to 15 percent slopes (Wqc)	IIIe.
Inclusions of areas with 8 to 15 percent slopes, severely eroded, and 15 to 25 percent slopes, moderately eroded or less	IVe.
Severely eroded inclusion of 15 to 25 percent slopes	VIe.
Worth very stony fine sandy loam, 0 to 8 percent slopes (Wsb)	VIs.
Worth very stony fine sandy loam, 8 to 25 percent slopes (Wsd)	VIs.
Worth and Parishville soils, 25 to 60 percent slopes (Wte)	VIIs.

Descriptions of Soils

This section contains descriptions of all the soils mapped in Franklin County. Under each soil series name, a typical soil of the series is described in detail. Following each series description are listed the mapping units that consist wholly or partly of soils of that series. Each mapping unit has a name that tells some of its own characteristics in addition to those that are common for the soil series. If there are significant items that are not apparent from the unit name, additional descriptive notes are given.

Many of the mapping units are undifferentiated soil groups composed of two or more kinds of soils. Soils are mapped as undifferentiated groups if the differences between them, especially those that affect agricultural suitability, are so slight that there is no practical advantage in mapping the soils separately.

To make the soil descriptions concise and exact, it was necessary to use many technical terms and to use some common words in special technical senses. Explanations of such terms are given in the glossary on p. 72.

The approximate acreage and present use of the soils mapped in detail in Franklin County are shown in table 4.

Adams Series

Soils of the Adams series are well drained to somewhat excessively drained Podzols. They have developed on well-sorted glaciofluvial sands derived mainly from granitic gneiss and Potsdam sandstone. The soils occur on deltas and on broad, nearly level to undulating sand plains. Other soils in the same catena with the Adams soils belong to the Croghan, Au Gres, Walpole, and Scarboro series.

Adams soils resemble the Colton soils, except that they are free from gravel throughout the profile. They have a B horizon of friable orterde. This is in contrast to the Wallace soils, which have a B horizon of cemented ortstein.

Adams and Wallace soils were not mapped separately in Franklin County because the ortstein is not mappable by association with visible features of the land surface, and the detailed investigation necessary to make the separation would not have been justified by the small difference in agricultural potential of the two soils.

TABLE 4.—*Estimated acreage and present use of soils mapped in detail*

Acreage estimates based on a 15-percent sampling of the 310,000 acres mapped in detail in the county. Mapping units estimated at 300 acres may range from 100 to 500 acres in size. Those estimated at 600, 800, or 1,000 acres may vary as much as 300 acres from value shown in table. Areas estimated at 3,000 acres or more are within 10 percent of the value given.

[Except that percentages of soils used for residential purposes is not shown, estimates of present land use are accurate for the 15-percent sample. Values given should be fairly reliable for mapping units of 3,000 acres or more, but are proportionately less reliable for smaller areas. Values thought to be considerably in error are marked with an asterisk.

[Leaders in columns indicate soil not commonly used for purpose indicated]

Map symbol	Soil name	Area	Present use			
			Crops	Pasture	Idle	Woods
		Acres	*Percent*	*Percent*	*Percent*	*Percent*
Aaa	Adams and Wallace loamy sands, 0 to 3 percent slopes	2,000	34	11	39	16
Aab	Adams and Wallace loamy sands, 3 to 8 percent slopes	2,500	26	18	23	33
Aad	Adams and Wallace loamy sands, 12 to 25 percent slopes	600	*32	30	6	32
Abb	Adams and Colton soils, 3 to 8 percent slopes, severely eroded	2,500	13	8	45	30
Abd	Adams and Colton soils, 8 to 25 percent slopes, severely eroded	1,000	8	13	72	6
Ace	Adams and Colton soils, 25 to 60 percent slopes	1,500		37	15	45
Ada	Au Gres-Scarboro-Croghan association	14,000	1	2	1	96
Bab	Becket and Skerry stony sandy loams, 3 to 8 percent slopes	2,000	62	21	13	4
Bac	Becket and Skerry stony sandy loams, 8 to 15 percent slopes	600	26	19	52	2
Bbb	Becket, Skerry, and Hermon very stony sandy loams, 3 to 8 percent slopes	3,500		36	32	31
Bbd	Becket, Skerry, and Hermon very stony sandy loams, 8 to 25 percent slopes	2,000		26	17	57
Bce	Becket and Hermon soils, 25 to 60 percent slopes	300				
Bda	Birdsall loam, 0 to 2 percent slopes	1,000	10	28	5	57
Bea	Brayton stony loam, 0 to 3 percent slopes	11,000	67	24	1	5
Beb	Brayton stony loam, 3 to 8 percent slopes	6,000	73	23	1	3
Bfb	Brayton very stony loam, 0 to 8 percent slopes	6,000		72	3	25
Caa	Colton and Constable gravelly loamy sands, 0 to 3 percent slopes	1,500	12	35	8	45
Cab	Colton and Constable gravelly loamy sands, 3 to 8 percent slopes	7,000	41	21	19	15
Cbb	Colton and Constable cobbly loamy sands, 3 to 8 percent slopes	1,000	52	33	12	3
Ccc	Colton and Constable gravelly and cobbly loamy sands, 8 to 15 percent slopes	2,000	34	34	22	7
Ccd	Colton and Constable gravelly and cobbly loamy sands, 15 to 25 percent slopes	1,000	17	46	3	34
Cda	Cook gravelly and cobbly loamy sands, 0 to 5 percent slopes	600	*60	34	5	
Cea	Cook stony and very stony loamy sands, 0 to 5 percent slopes	11,000	7	34	1	59
Cfa	Coveytown cobbly loamy sand, 0 to 6 percent slopes	3,500	71	22	1	6
Cga	Coveytown gravelly loamy sand, 0 to 3 percent slopes	300	54	46		
Cha	Coveytown stony and very stony loamy sands, 0 to 6 percent slopes	13,000	6	49	1	44
Cka	Covington silty clay loam, 0 to 2 percent slopes	17,000	78	15	4	3
Cma	Covington silty clay loam over till, 0 to 2 percent slopes	600	51	30		19
Cna	Croghan loamy sand, 0 to 3 percent slopes	4,000	42	13	14	30
Cnb	Croghan loamy sand, 3 to 15 percent slopes	1,500	20	29	28	22
Coa	Croghan loamy sand over clay, 0 to 3 percent slopes	300	62	33	5	
Cpa	Croghan fine sandy loam over clay, 0 to 6 percent slopes	1,000	95	5		
Cqb	Croghan sandy loam over till, 0 to 6 percent slopes	1,000	45	48	4	2
Daa	Duane gravelly sandy loam, 0 to 3 percent slopes	800	71	12		16
Dab	Duane gravelly sandy loam, 3 to 8 percent slopes	800	76	19	4	1
Dba	Duane cobbly sandy loam, 0 to 3 percent slopes	300	10	60	5	25
Dbb	Duane cobbly sandy loam, 3 to 8 percent slopes	300	50	20	20	10
Eaa	Empeyville stony very fine sandy loam, 0 to 3 percent slopes	5,000	72	23	1	4
Eab	Empeyville stony very fine sandy loam, 3 to 8 percent slopes	7,000	63	23	7	7
Eac	Empeyville stony very fine sandy loam, 8 to 15 percent slopes	1,000	57	29	11	3
Ebb	Empeyville very stony very fine sandy loam, 0 to 8 percent slopes	7,000		61	3	36
Ecd	Empeyville and Moira stony very fine sandy loams, 15 to 25 percent slopes	300	18	82		
Edc	Empeyville and Moira very stony very fine sandy loams, 8 to 25 percent slopes	3,000		49	2	49
Faa	Fahey gravelly loamy sand, 0 to 3 percent slopes	300	94	6		
Fab	Fahey gravelly loamy sand, 3 to 8 percent slopes	300	15	85		
Fba	Fahey cobbly and stony loamy sands, 0 to 3 percent slopes	3,000	56	34	1	10
Fbb	Fahey cobbly and stony loamy sands, 3 to 8 percent slopes	1,500	57	23	4	6
Fcb	Fahey very stony loamy sand, 0 to 8 percent slopes	1,500		85	4	11
Gab	Grenville stony loam, 2 to 8 percent slopes	2,000	65	27		8
Gac	Grenville stony loam, 8 to 15 percent slopes	300	56	44		
Gbb	Grenville and Hogansburg very stony loams, 2 to 8 percent slopes	9,000		82	6	11
Gbc	Grenville and Hogansburg very stony loams, 8 to 25 percent slopes	300		60		40
Hac	Hermon stony sandy loam, 3 to 15 percent slopes	600	21	11	47	21
Hbb	Hogansburg stony loam, 2 to 8 percent slopes	7,000	48	46	3	3
Kab	Kars gravelly sandy loam, 0 to 8 percent slopes	1,000	*100			
Kbb	Kars cobbly and stony loams, 0 to 8 percent slopes	800	69	31		
Laa	Livingston silty clay loam, 0 to 2 percent slopes	4,000	35	25	9	32
Lba	Livingston stony clay loam, 0 to 2 percent slopes	1,500	19	39		42
Lca	Livingston very stony clay loam, 0 to 2 percent slopes	300		80		20
Maa	Madalin silt loam, 0 to 2 percent slopes	4,000	72	24		1

TABLE 4.—*Estimated acreage and present use of soils mapped in detail*—Continued

Map symbol	Soil name	Area	Present use			
			Crops	Pasture	Idle	Woods
		Acres	*Percent*	*Percent*	*Percent*	*Percent*
Mba	Madalin stony silt loam, 0 to 2 percent slopes	1,500	41	51	--	8
Mca	Massena stony loam, 0 to 4 percent slopes	3,000	45	49	2	3
Mdb	Massena very stony loam, 0 to 8 percent slopes	3,000	--	88	--	12
Mea	Moira stony loam, 0 to 3 percent slopes	3,000	73	20	--	8
Meb	Moira stony loam, 3 to 8 percent slopes	8,000	81	17	1	1
Mec	Moira stony loam, 8 to 15 percent slopes	300	55	33	--	8
Mfb	Moira very stony loam, 0 to 8 percent slopes	1,500	--	69	4	27
	Muck:					
Mga	Deep	300	--	52	10	38
Mha	Shallow	1,500	3	42	10	44
Naa	Nicholville fine sandy loam, 0 to 2 percent slopes	800	59	15	--	7
Nab	Nicholville fine sandy loam, 2 to 6 percent slopes	2,000	72	22	--	7
Nac	Nicholville fine sandy loam, 6 to 12 percent slopes	300	85	15	--	--
Nba	Nicholville stony fine sandy loam over till, 0 to 2 percent slopes	1,000	66	17	14	4
Nbb	Nicholville stony fine sandy loam over till, 2 to 6 percent slopes	2,000	64	14	8	15
Nbc	Nicholville stony fine sandy loam over till, 6 to 12 percent slopes	300	15	38	46	--
Oaa	Ondawa and Genesee fine sandy loams, 0 to 2 percent slopes	300	24	66	--	10
Oba	Ondawa and Genesee fine sandy loams, high bottoms, 0 to 2 percent slopes	300	20	40	--	40
Paa	Panton silty clay loam, 2 to 6 percent slopes	600	84	16	--	--
Pbb	Parishville stony loam, 2 to 8 percent slopes	300	16	73	--	11
Pcb	Parishville very stony loam, 2 to 8 percent slopes	300	--	32	68	--
Pda	Podunk and Eel fine sandy loams, 0 to 2 percent slopes	300	9	65	26	--
Pea	Podunk and Eel fine sandy loams, high bottoms, 0 to 2 percent slopes	300	20	18	13	7
Raa	Rhinebeck silt loam, 0 to 2 percent slopes	1,500	78	20	--	1
Rab	Rhinebeck silt loam, 2 to 6 percent slopes	600	63	37	--	--
Rbb	Ridgebury stony sandy loam, 0 to 8 percent slopes	600	17	46	37	--
Rcb	Ridgebury very stony sandy loam, 0 to 10 prcent slopes	2,500	--	52	16	32
Rd	Rockland, sandstone and granite	300	--	72	11	16
Rea	Rumney and Wayland fine sandy loams, 0 to 2 percent slopes	1,000	36	37	14	12
Rfa	Rumney and Wayland fine sandy loams, high bottoms, 0 to 2 percent slopes	300	--	100	--	--
Saa	Saco and Sloan soils, 0 to 2 percent slopes	3,000	8	47	6	36
Sba	Salmon very fine sandy loam, 0 to 2 percent slopes	300	100	--	--	--
Sbb	Salmon very fine sandy loam, 2 to 6 percent slopes	2,000	58	11	6	4
Sbc	Salmon very fine sandy loam, 6 to 12 percent slopes	300	57	4	--	11
Sca	Salmon stony very fine sandy loam over till, 0 to 2 percent slopes	800	92	3	--	5
Scb	Salmon stony very fine sandy loam over till, 2 to 6 percent slopes	600	60	40	--	--
Scc	Salmon stony very fine sandy loam over till, 6 to 12 percent slopes	300	*100	--	--	--
Sce	Salmon stony very fine sandy loam over till, 20 to 45 percent slopes	300	--	50	14	4
Sdd	Salmon and Nicholville stony very fine sandy loams, 12 to 20 percent slopes	600	--	16	7	4
Sea	Scarboro fine sandy loam, 0 to 3 percent slopes	600	41	31	2	27
Sfa	Scarboro loam, neutral variant, 0 to 3 percent slopes	5,000	14	28	9	49
Sga	Scarboro loam, neutral variant, over till or clay, 0 to 3 percent slopes	3,000	19	28	--	52
	Stony land:					
Sh	Hermon and Becket soils	300	--	15	24	62
Sk	Worth and Parisville soils	300	--	47	4	48
Sma	Sun stony loam, 0 to 5 percent slopes	4,000	37	53	1	10
Sna	Sun very stony loam, 0 to 5 percent slopes	7,000	--	70	2	28
Soa	Swanton fine sandy loam, neutral variant, 0 to 3 percent slopes	2,500	90	4	--	6
Taa	Trout River gravelly loamy sand, 0 to 3 percent slopes	800	80	20	--	--
Tab	Trout River gravelly loamy sand, 3 to 8 percent slopes	1,500	58	32	6	5
Tba	Trout River cobbly loamy sand, 0 to 3 percent slopes	1,500	47	29	--	23
Tbb	Trout River cobbly loamy sand, 3 to 8 percent slopes	2,000	44	37	8	11
Tca	Tughill and Dannemora stony very fine sandy loams, 0 to 3 percent slopes	800	42	39	6	13
Tda	Tughill and Dannemora very stony very fine sandy loams, 0 to 3 percent slopes	6,000	--	50	1	49
Waa	Wallington very fine sandy loam, 0 to 2 percent slopes	1,000	60	12	24	4
Wba	Wallington stony very fine sandy loam, over till, 0 to 2 percent slopes	2,000	33	23	8	36
Wca	Walpole sandy loam, 0 to 6 percent slopes	1,000	56	32	5	7
Wda	Walpole fine sandy loam, neutral variant, 0 to 3 percent slopes	300	--	--	--	--
Wea	Walpole loam, neutral variant, 0 to 3 percent slopes	800	99	1	--	--
Wfa	Walpole sandy loam, neutral variant, over till, 0 to 5 percent slopes	3,000	48	31	--	21
Wga	Walpole loamy sand, neutral variant, over clay, 0 to 3 percent slopes	3,000	79	7	7	7
Wha	Walpole and Au Gres loamy sands, 0 to 6 percent slopes	1,500	66	19	7	9
Wka	Walpole, neutral variant, and Au Gres loamy sands, 0 to 6 percent slopes	5,000	44	22	9	25
Wma	Westbury and Dannemora stony very fine sandy loams, 0 to 3 percent slopes	5,000	72	16	8	5
Wmb	Westbury and Dannemora stony very fine sandy loams, 3 to 8 percent slopes	2,000	61	31	4	4
Wna	Westbury and Dannemora very stony fine sandy loams, 0 to 8 percent slopes	8,000	--	55	3	42
Woc	Westbury and Brayton very stony very fine sandy loams, 8 to 15 percent slopes	300	--	51	11	38

TABLE 4.—*Estimated acreage and present use of soils mapped in detail*—Continued

Map symbol	Soil name	Area	Present use			
			Crops	Pasture	Idle	Woods
		Acres	*Percent*	*Percent*	*Percent*	*Percent*
Wpa	Whitman very stony fine sandy loam, 0 to 8 percent slopes	1, 000	-------	31	30	39
Wqa	Worth stony fine sandy loam, 0 to 3 percent slopes	600	43	43	5	9
Wqb	Worth stony fine sandy loam, 3 to 8 percent slopes	2, 500	45	31	4	20
Wqc	Worth stony fine sandy loam, 8 to 15 percent slopes	300	46	54	-------	-------
Wsb	Worth very stony fine sandy loam, 0 to 8 percent slopes	2, 500	-------	63	15	23
Wsd	Worth very stony fine sandy loam, 8 to 25 percent slopes	2, 000	-------	54	-------	46
Wte	Worth and Parishville soils, 25 to 60 percent slopes	1, 000	-------	40	14	44
	Total	310, 000				

Typical profile (Adams loamy sand—undisturbed):

- A_0 Mor humus layer; extremely acid; 1 to 3 inches thick.
- A_2 0 to 4 inches, gray (10YR 6/1) medium sand; single grain; loose; extremely acid; 2 to 6 inches thick; abrupt irregular lower boundary.
- B_{2h} 4 to 5 inches, dark reddish-brown to black (5YR 2/2 to 2/1) loamy sand high in organic matter; weak fine crumb; friable; very strongly acid; ½ to 1 inch thick; abrupt irregular lower boundary.
- B_{21r} 5 to 11 inches, strong-brown (7.5YR 5/5 to 5/8) loamy sand; single grain; friable but may be weakly and discontinuously cemented; strongly to very strongly acid; 4 to 10 inches thick; gradual wavy lower boundary.
- B_3 11 to 26 inches, yellowish-brown to brownish-yellow (10YR 5/6 to 6/6) medium sand; single grain; friable, but some weakly cemented gravel-size aggregates occur; strongly acid; 12 to 20 inches thick; gradual wavy lower boundary.
- C 26 inches +, light yellowish-brown (10YR 6/4) medium sand; single grain; friable; medium to strongly acid.

Range in characteristics: The upper part of the profile varies from place to place, because plowing generally mixes the A_0, A_2, and B_{2h} horizons and the upper part of the B_{21r} horizon. The texture of the resulting A_p horizon is very friable loamy sand, and the color is very dark grayish brown to dark gray (10YR 3/2 to 4/1). The parent material ranges from predominatly medium sand to predominantly fine sand. Wind- and water-eroded areas, where the A_2 and part of the B horizons are missing, are common. In places the B_{2h} horizon is not clearly defined, but humus accumulation is indicated by the dark reddish-brown color in the upper 1 or 2 inches of the B_{21r} horizon.

Relief: Nearly level to steep.

Drainage: Runoff is slow on nearly level areas and medium on sloping to steep areas. Internal drainage is rapid.

Native vegetation: White pine, hemlock, aspen, and some hardwoods. Dense stands of small gray birch and aspen trees are common on areas once cultivated but later abandoned.

MAPPING UNITS

The following mapping units are undifferentiated groups, each composed of an Adams soil and one or more soils of other series.

Adams and Colton soils, 3 to 8 percent slopes, severely eroded (Abb; Group 23 [2]).—This mapping unit consists of severely eroded Adams, Colton, Wallace, and Constable soils, and some areas of eroded Croghan soils. Most of the Adams and Colton soils are covered by only sparse vegetation and are actively eroding. Native grasses or plantings of pine have stabilized some of the areas, however, so that erosion is no longer active.

The A_p horizon, or its equivalent (the upper 6 inches of uneroded soil), has been eroded from most of the soils. In some places part, or all, of the B_2 horizon has been removed. The ortstein outcrops prominently on some of the eroded Wallace and Constable soils included in the mapping unit. Nearly level and gently undulating areas have been eroded mainly by wind. Both wind and water have eroded the sloping areas.

Adams and Colton soils, 8 to 25 percent slopes, severely eroded (Abd; Group 23).—Water has been the principal cause of erosion on these soils, but some erosion has been caused by wind.

Adams and Colton soils, 25 to 60 percent slopes (Ace; Group 22).—These soils occupy the steep slopes of deltas and kames or areas adjacent to drainageways. The glacial till in the areas near drainageways occurs at depths of 2 to 3 feet.

Adams and Wallace loamy sands, 0 to 3 percent slopes (Aaa; Group 12).—Most areas of this mapping unit include both Adams and Wallace soils. Some areas, however, consist of either Adams soil or Wallace soil alone. Included in this mapping unit are small areas of Croghan soils.

Adams and Wallace loamy sands, 3 to 8 percent slopes (Aab; Group 12).

Adams and Wallace loamy sands, 12 to 25 percent slopes (Aad; Group 20).—This mapping unit occurs only on the forest slopes of deltas or on narrow strips bordering drainage channels.

Au Gres Series

Soils of the Au Gres series are somewhat poorly drained to poorly drained Podzols. They have developed on well-sorted, water-deposited glacial sands derived mainly from granitic gneiss and silica-cemented sandstone. These soils generally occur on the nearly level parts of broad sand plains. The associated soils belong to the Adams, Croghan, Walpole, and Scarboro series.

Typical profile (Au Gres loamy sand—undisturbed):

- A_0 Very dark gray to black mor humus layer; very strongly to extremely acid; 3 to 5 inches thick.
- A_2 0 to 6 inches, pinkish-gray to light-gray (7.5YR 7/2 to 10YR 7/1) or white (2.5Y 8/2) medium sand; single grain; friable; very strongly acid; 4 to 12 inches thick; abrupt irregular lower boundary.
- B_{21} 6 to 12 inches, variably colored dark reddish-brown, dark-brown, or strong-brown (5YR 3/3 or 7.5YR 4/4 to 5/6) loamy sand; the color generally grading from low to high chroma with depth; single grain or cemented into a discontinuous ortstein; friable parts commonly contain cemented aggregates ½ to 2 inches across; medium to strongly acid; 4 to 12 inches thick; gradual wavy lower boundary.
- B_{22} 12 to 24 inches, variably colored dark-brown, strong-brown, dark yellowish-brown, or yellowish-brown (7.5 YR 4/4 or 5/6 to 10YR 5/6 or 4/4) medium sand; color

[2] Number indicates management group to which mapping unit belongs.

generally in large diffuse mottles and usually of higher chroma and value than in horizon immediately above; generally single grain; friable, sometimes weakly and discontinuously cemented; medium to strongly acid; 10 to 20 inches thick; gradual wavy lower boundary.

B_3 24 to 30 inches, light yellowish-brown to dark yellowish-brown (10YR 6/4 to 4/4) medium sand; in many places containing mottles of higher chroma; single grain; friable; medium to strongly acid; gradual lower boundary.

C 30 inches +, very pale brown to light yellowish-brown (10YR 7/3 to 6/4) medium sand; single grain and friable; medium acid to neutral; parent material low in bases, but reaction influenced in many places by neutral ground water.

Range in characteristics: In some areas occupied by the Au Gres soils, plowing mixes only the A_0 and A_2 horizons. In others it includes part of the B_{21} horizon. As a result, freshly plowed fields of Au Gres soils present a striking color pattern of gray or dark gray and dark brown. The B_3 horizon is absent in some areas of Au Gres soils. In some poorly drained areas, the A_2 horizon is 18 to 24 inches thick, and the B horizon has colors of comparatively low chroma and value. A nearly black horizon of humus accumulation, 1 to 3 inches thick, occurs below the A_2 horizon in some imperfectly drained areas.

Relief: Nearly level to gently undulating.

Drainage: Runoff is very slow, and because of the high water table, internal drainage is slow. Permeability is rapid.

Native vegetation: Spruce, larch, balsam fir, hemlock, white pine, and some hardwoods. Thickets of gray birch and aspen grow on abandoned fields that once were cultivated.

MAPPING UNITS

The Au Gres soils are important components of three mapping units in Franklin County: (1) The Au Gres-Scarboro-Croghan association, which is described below: (2) Walpole and Au Gres loamy sands, 0 to 6 percent slopes, and (3) Walpole, neutral variant, and Au Gres loamy sands, 0 to 6 percent slopes, both described with the Walpole series.

Au Gres-Scarboro-Croghan association (Ada; Group 24).—Soils of this association occur on the broad sand plains in the northwestern part of the county. The association occupies comparatively large areas of dense second-growth woodland. It is unlikely that these areas will be cleared for agricultural use within the foreseeable future.

The association is made up of the following soils: Au Gres, 1 to 3 percent slopes, 40 percent; Scarboro, 0 to 2 percent slopes, 30 percent; Croghan and Adams, 3 to 12 percent slopes, 20 percent; and Muck, Walpole, Massena, and Brayton soils, 10 percent.

A large part of this association is a complex pattern of soils in small areas of 2 to 10 acres. In some areas, however, the pattern is simple and the soils occur in comparatively large areas.

Neutral variants of the Scarboro and Walpole soils are more common in this association than acid Scarboro and Walpole soils.

Becket Series

Soils of the Becket series are well-drained Podzols that have a strongly developed fragipan below the Podzol profile. In Franklin County these soils have developed on glacial till derived mainly from both granitic and syenitic gneiss and anorthosite. The soils occur in the Adirondack Mountains section of Franklin County on the slopes of hills and mountains covered by glacial till. They are associated with soils of the Hermon, Skerry Ridgebury, and Whitman series. Except for the degree of development of the fragipan, the Becket soils resemble the Hermon soils. They resemble the Worth soils except in type of parent material, and the Skerry soils except for drainage.

Typical profile (Becket stony sandy loam—undisturbed):

A_0 Very dark gray to black mor humus horizon; extremely acid; 2 to 4 inches thick.

A_2 0 to 3 inches, pinkish-gray to brown (7.5YR 6/2 to 5/2) stony sandy loam; single grain; friable; extremely acid; 2 to 4 inches thick; abrupt irregular lower boundary.

B_{2h} 3 to 4 inches, dark reddish-brown to black (5YR 2/2 to 2/1) sandy loam; weak very fine crumb; friable; extremely acid; very high in organic matter; ½ to 1 inch thick; abrupt irregular lower boundary.

B_2 4 to 10 inches, dark reddish-brown to yellowish-red (5YR 3/4 to 4/6) sandy loam, the color grading to strong brown (7.5YR 5/6) with depth; weak fine crumb; friable; the slippery consistence when moist suggests a high organic-matter content; very strongly acid; 4 to 12 inches thick; clear wavy lower boundary.

B_3 10 to 20 inches, brown to dark yellowish-brown, (10YR 4/3 to 4/4) sandy loam or loamy sand; weak very fine crumb to single grain; friable; strongly acid; 6 to 14 inches thick; clear smooth lower boundary.

B'_{21} 20 to 36 inches, dark-brown to dark yellowish-brown (10YR 4/3 to 4/4) loamy sand; weak to moderate thick platy; very firm to extremely firm in place; peds very firm and brittle when removed; some low-contrast yellowish-brown mottles; rock fragments have gray silty coatings 1/2 to 2 millimeters thick on their upper surfaces; strongly acid; diffuse lower boundary.

B'_{22} 36 to 60 inches, light olive-brown (1Y 5/3) loamy sand; very weak thick platy or massive; very firm in place; fragments firm and brittle when removed; strongly acid; in many places this horizon contains small pockets of light yellowish-brown friable medium sand.

C 60 inches +, grayish-brown 10YR 5/2 loamy sand; strongly acid; two types of structure and consistence: (a) single grain and somewhat firm in place, and (b) weak thick platy or massive and very firm to extremely firm in place.

Range in characteristics: The solum above the fragipan (B_2'horizon) is 18 to 34 inches thick, and the fragipan is 3 to 6 feet thick. Texture of the Podzol B horizon ranges from fine sandy loam to light sandy loam. In some places the humus accumulation in the Podzol B horizon does not occur as a distinct B_{2h} horizon. Instead, a dark reddish-brown (5YR 3/3) zone, 1 to 2 inches thick, occurs in the uppermost part of the horizon. A few fine distinct mottles occur in many places immediately above the B'_2 horizon. Structure of the B'_2 horizon ranges from very weak medium platy, approaching massive, to moderate thick platy. The C horizon ranges from single grain firm loamy sand to massive extremely firm loamy sand.

Relief: Gently sloping to steep.

Drainage: Runoff is medium to rapid, depending upon slope. Permeability is moderate above the pan, but slow within the pan.

Native vegetation: Hemlock, hard maple, beech, yellow birch.

MAPPING UNITS

The following mapping units are undifferentiated groups, each consisting of Becket soils and soils of one or more other series.

Becket and Skerry stony sandy loams, 3 to 8 percent slopes (Bab; Group 1).—Soils of this mapping unit occur on the northern fringe of the mountainous part of the county. An individual area

may consist of a Becket soil alone or of a Skerry soil, or it may include both. Small areas of Hermon soils are included in the complex.

Becket and Skerry stony sandy loams, 8 to 15 percent slopes (Bac; Group 1).

Becket, Skerry, and Hermon very stony sandy loams, 3 to 8 percent slopes (Bbb; Group 18).—Individual areas of this unit may contain only one of the three named soils, only two, or a combination of all three.

Becket, Skerry and Hermon very stony sandy loams, 8 to 25 percent slopes (Bbd; Group 18).—Except for slope this unit resembles Becket, Skerry and Hermon very stony sandy loams, 3 to 8 percent slopes.

Becket and Hermon soils, 25 to 60 percent slopes (Bce; Group 22).—Areas of this mapping unit may consist of a Becket soil alone or of a Hermon soil. In some areas both soils occur. Stones on the surface generally cause the soils to be classed as moderately stony (stoniness class 2) or very stony (stoniness class 3). The most common mapping inclusions are Skerry soils or soils that are moderately deep to bedrock.

Birdsall Series

The Birdsall series, represented in Franklin County by Birdsall loam, 0 to 2 percent slopes, is comprised of very poorly drained soils. The soils have developed on fine sand and silt of glaciolacustrine origin. They generally occur in small depressions in association with Salmon, Nicholville, and Wallington soils.

Typical profile (Birdsall loam—undisturbed):

- A_0 Black medium acid muck, 0 to 6 inches thick.
- A_1 0 to 7 inches, very dark gray to black (10YR 3/1 to 2/1) loam; weak crumb; friable; medium acid; 6 to 12 inches thick; clear smooth lower boundary.
- G 7 to 20 inches, light-gray to gray (10YR 7/1 to 6/1) silt loam to very fine sandy loam; a few large distinct yellowish-brown or brown mottles; weak crumb, approaching massive; friable; medium acid; 12 to 18 inches thick; gradual lower boundary.
- C 20 inches +, light brownish-gray to grayish-brown (10YR 6/2 to 5/2) very fine sand and silt; massive or varved; friable; medium to slightly acid.

Range in characteristics: The A_0 horizon is absent in some areas of Birdsall loam. Texture of the A_1 horizon ranges from fine sandy loam to silt loam. Reaction of the solum is slightly acid to strongly acid. The lacustrine parent material, which ranges from 2 to about 10 feet thick, is underlain by firm medium-textured glacial till.

Relief: Nearly level or depressed.

Drainage: Both surface runoff and internal drainage are very slow.

Native vegetation: Soft maple, elm, alder, willow, and white-cedar.

MAPPING UNIT

The following mapping unit is the only member of the Birdsall series that occurs in Franklin County.

Birdsall loam, 0 to 2 percent slopes (Bda; Group 16).—This soil resembles the profile of Birdsall loam described for the series. Mapped with the soil are soils that resemble it, but that are moderately deep to glacial till. These included soils are generally slightly stony.

Brayton Series

Soils of the Brayton series are somewhat poorly drained to poorly drained Podzols. They have developed on weakly calcareous glacial till derived mainly from Potsdam sandstone, but partly from Beekmantown limestone. The soils occur on the broad smooth till plain in association with Parishville, Moira, and Sun soils. In the southern part of the area in which they appear in Franklin County, they are associated with Empeyville and Worth soils. The Brayton soils differ from the Westbury soils in reaction and in the development of the fragipan horizon.

Typical profile (Brayton stony loam—cultivated):

- A_p 0 to 6 inches, very dark brown (10YR 2/2) stony loam; weak medium crumb; friable; medium acid; 5 to 7 inches thick; clear smooth lower boundary.
- B_{2g} 6 to 9 inches, dark grayish-brown to brown (10YR 4/2 to 4/3) loam or fine sandy loam; a few faint mottles; weak fine crumb; friable; medium acid; 0 to 4 inches thick; clear smooth lower boundary.
- B_{3g} 9 to 17 inches, light olive-brown (2.5Y 5/6 to 5/4) stony fine sandy loam; a few medium faint yellowish-brown mottles; weak fine blocky; friable; medium to slightly acid; 7 to 14 inches thick; clear smooth lower boundary.
- A'_2 17 to 22 inches, pale-olive to pale-yellow (5Y 6/3 to 7/3) stony sandy loam or fine sandy loam; moderate thick platy grading to moderate medium blocky; very firm in place; peds firm and brittle; slightly acid to neutral; numerous distinct yellowish-brown mottles; 4 to 6 inches thick; clear smooth lower boundary.
- B'_2 22 to 41 inches, dark grayish-brown to brown (10YR 4/2 to 4/3) stony fine sandy loam to sandy loam that generally contains slightly more clay than horizon immediately above; weak to moderate medium blocky; firm to very firm; a few medium faint dark yellowish-brown and grayish-brown mottles; 16 inches to 3 feet thick; diffuse lower boundary.
- C_1 41 inches +, pale-olive to light brownish-gray (5Y 6/3 to 2.5Y 6/2) stony fine sandy loam to sandy loam; in many places contains a few large distinct yellowish-brown and grayish-brown mottles; weak coarse blocky, weak thick platy, or massive; firm in place; slightly acid to neutral, locally calcareous.

Range in characteristics: Undisturbed profiles in wooded areas have the following upper horizons:

- A_0 Matted acid mor humus layer; 2 to 4 inches thick.
- A_1 0 to ½ inch, black to dark-gray loam; weak crumb; strongly acid; 0 to 1 inch thick.
- A_2 ½ to 3 inches, pinkish-gray to pinkish-white stony fine sandy loam; loose; single grain; strongly acid; 1 to 5 inches thick; abrupt irregular lower boundary.
- B_{2g} 3 to 9 inches, similar to B_{2g} horizon of cultivated area of Brayton stony loam described above.

Where Brayton soils grade to the more acid Westbury soils, the entire solum to a depth of about 30 inches is generally medium to strongly acid. Where the Brayton soils grade to the Massena soils, which are high in lime, the entire solum is generally slightly acid to neutral. Texture of the surface horizon of the Brayton soils ranges from fine sandy loam to silt loam, and that of the subsoil, from sandy loam to loam.

Mapped with the Brayton soils are poorly drained soils that have an A_1 horizon similar to the A_p horizon of cultivated areas of Brayton stony loam, but that lack the brownish B_{2g} horizon. Sandy loam types are commonly included in Brayton mapping units in the western part of the county, especially north of Moira and Brushton.

Relief: Nearly level to gently sloping.

Drainage: Both surface runoff and internal drainage are slow.

Native vegetation: Maple, elm, hornbeam, and some white-cedar, white pine, and hemlock. Generally, hardhack and meadowsweet make a dense growth on unimproved native pastures.

MAPPING UNITS

The following mapping units are phases of soils in the Brayton series.

Brayton stony loam, 0 to 3 percent slopes (Bea; Group 3).—Some areas of nonstony soil (stoniness class 0) are included in this mapping unit.

Brayton stony loam, 3 to 8 percent slopes (Beb; Group 3).—Some small areas that have slopes of 8 to 15 percent are mapped with this soil. Also included are some nonstony areas.

Brayton very stony loam, 0 to 8 percent slopes (Bfb; Group 19).

Colton Series

The Colton soils are well drained to somewhat excessively drained Podzols. In most areas they have developed on gravelly glaciofluvial deposits derived mainly from Potsdam sandstone, granitic gneiss, and anorthosite. In the mountainous section of the county, however, Potsdam sandstone is only a minor constituent of the parent material. The soils occur on deltas, smooth outwash plains, and rolling kames. In many places they are associated with the Adams and Croghan soils. The series is a member of the Colton-Duane-Walpole-Scarboro catena.

In Franklin County the Colton soils are mapped in the same unit with Constable soils, which, except for the consistence of the B_2 horizon, are very similar. The B_2 horizon of the Colton soils is a friable orterde, but in the Constable soils, it is a well-cemented ortstein. Both soils generally occupy areas of the same glacial deposit. In many places they occur in a complex pattern. The presence or absence of the ortstein is not known to be associated with any visible surface feature.

Typical profile (Colton gravelly loamy sand—undisturbed):

- A_0 Black mor humus very strongly to extremely acid; 1½ to 4 inches thick.
- A_2 0 to 6 inches pinkish-gray (7.5YR 7/2) loamy sand; single grain; friable; very strongly to extremely acid; 3 to 12 inches thick; abrupt irregular lower boundary.
- B_{2h} 6 to 7 inches, black to dark reddish-brown (5YR 2/1 to 2/2) gravelly loamy sand high in organic matter; weak fine crumb; friable; very strongly to extremely acid; ½ to 3 inches thick; clear irregular lower boundary.
- B_{2ir} 7 to 18 inches, dark reddish-brown (5YR 3/4), grading with depth to yellowish-red (5YR 4/8) and strong-brown (7.5YR 5/8) gravelly loamy sand; single grain or weak very fine crumb; friable, but in many places contains some weakly to moderately cemented aggregates 1 to 5 centimeters in diameter; very strongly acid; 6 to 14 inches thick; narrow tongues may extend downward to a depth of 30 inches; gradual wavy lower boundary.
- B_3 18 to 24 inches, brownish-yellow (10YR 6/8) loamy sand or sand; single grain; friable; strongly acid; 5 to 10 inches thick; gradual wavy lower boundary.
- C 24 inches +, light olive-brown (2.5Y 5/4) to light brownish-gray (10YR 6/2) stratified sand and gravel; loose to somewhat firm; strongly acid. In places dark yellowish-brown horizontal bands, 2 to 3 millimeters thick, occur in this horizon.

Range in characteristics: Plowing mixes the A_0 and A_2 horizons, and in many places the upper part of the B_2 horizon, to produce a dark-brown to dark grayish-brown (10YR 4/3 to 4/2) loamy sand in which the structure is a weak fine crumb. In Franklin County gravelly loamy sand and loamy coarse sand are the predominant soil types in this series, but there are some areas of light sandy loam.

Although the parent material is strongly acid, secondary accumulations of calcium carbonate occur in some places at depths of 10 to 12 feet or more. These secondary accumulations are in the deeper gravel deposits.

The parent material generally consists of subangular sand grains and gravel fragments; locally, however, the sand grains are sharply angular, which indicates that water transportation of these materials was of short duration. Lenses of very fine sand and silt, a few inches to more than a foot in thickness, are common in the parent material. Where these lenses are at depths of 4 to 10 feet, they help to retain water and so improve the productivity of the soil. In many places where they occur at shallower depths, they underlie small areas of Duane soils, which are included in the Colton and Constable mapping units.

Relief: Nearly level to steep.

Drainage: Runoff is slow to very slow, depending on slope. Internal drainage is very rapid.

Native vegetation: Second-growth vegetation generally consists of trees of a maple-beech association, but white pine was predominant in the virgin forests. As a rule areas that have been severely burned over by forest fires are covered by a heathlike vegetation composed mainly of bracken and blueberries.

MAPPING UNITS

The following mapping units are undifferentiated groups of Colton and Constable soils.

Colton and Constable gravelly loamy sands, 0 to 3 percent slopes (Caa; Group 12).

Colton and Constable gravelly loamy sands, 3 to 8 percent slopes (Cab; Group 12).

Colton and Constable cobbly loamy sands, 3 to 8 percent slopes (Cbb; Group 12).

Colton and Constable gravelly and cobbly loamy sands, 8 to 15 percent slopes (Ccc; Group 12).—The gravelly soils and the cobbly soils of this mapping unit occur in separate areas.

Colton and Constable gravelly and cobbly loamy sands, 15 to 25 percent slopes (Ccd; Group 20).—The gravelly soils and the cobbly soils of this unit occur in separate areas.

Constable Series

The Constable soils are so similar to the Colton soils that a detailed description is not given here. The B_{2ir} horizon of the Constable soils is cemented into a massive continuous ortstein that is hard when wet or dry. Generally the B_{2h} horizon is cemented and forms the upper boundary of the ortstein. In some places there is no distinct B_{2h} horizon, but dark irregular patches of humus accumulation occur throughout the ortstein. In other respects the Constable soils resemble the profile of Colton gravelly loamy sand described for the Colton series.

Cook Series

The Cook series consists of very poorly drained Half-Bog soils that have developed on coarse-textured alkaline or calcareous glacial till. The soils occur on the nearly level to gently undulating till plain in the northern part of the county. They are associated with soils of the Trout River, Fahey, and Coveytown series. Except for texture

the Cook soils resemble the Sun soils, and except for texture and reaction, they resemble the Tughill soils. Typical profile (Cook stony loamy sand—cultivated):

A_p 0 to 6 inches, black (10YR 2/1) loamy sand; weak fine and medium crumb; friable; slightly acid to neutral; 6 to 8 inches thick; clear smooth lower boundary.

G_1 6 to 9 inches, grayish-brown (2.5Y 5/2) or light grayish-brown (2.5Y 6/2) loamy sand; common faint large yellowish-brown mottles; single grain; loosely coherent; slightly acid to neutral; 3 to 6 inches thick; gradual lower boundary.

G_2 9 to 27 inches, grayish-brown (2.5Y 5/2) gravelly loamy sand mottled with light olive-brown (2.5Y 5/4) streaks; loosely coherent single grain; neutral; 1½ to 3 feet thick; lower part of this horizon in many places is dark grayish brown (2.5Y 4/2) and contains local areas of finer texture; clear or gradual lower boundary.

D 27 to 48 inches, fine sandy loam or loam; numerous large distinct strong brown (7.5YR 5/8), light olive-brown (2.5Y 5/4), and olive-gray (5Y 5/2) mottles in about equal proportions; massive to weak thick platy in the upper few inches; neutral to calcareous; mottling decreases with depth to a base color of light olive brown or olive gray.

Range in characteristics: Texture of the surface horizon of the Cook soils ranges from mucky loam to loamy sand. In many places areas of mucky loam or of fine sandy loam are mapped with the loamy sand. In undisturbed areas the surface horizon is entirely black well-decomposed muck, 4 to 12 inches thick. This muck in many places contains an appreciable amount of mineral matter, especially in the lower part of the horizon.

Texture of the solum ranges from gravelly loamy coarse sand to loamy medium sand. Stoniness ranges from nonstony (stoniness class 0) to very stony (stoniness class 4). Depth to the D horizon ranges from 20 to 60 inches.

Small areas of Sun soils are included in many places in the Cook mapping units.

Relief: Smooth nearly level slopes and small depressions.

Drainage: Both surface runoff and internal drainage are very slow. Permeability is moderate to rapid.

Native vegetation: Elm, soft maple, ash, basswood, and some hemlock and whitecedar.

MAPPING UNITS

The following mapping units are undifferentiated groups of soils in the Cook series.

Cook gravelly and cobbly loamy sands, 0 to 5 percent slopes (Cda; Group 17).—Some areas of this unit consist of gravelly soils and some of cobbly soils.

Cook stony and very stony loamy sands, 0 to 5 percent slopes (Cea; Group 21).—Individual areas of this unit may consist of either the stony or the very stony soil, or may be made up partly of stony and partly of very stony soil. Cultivated areas have been cleared of stones.

Coveytown Series

The Coveytown series consists of poorly drained Low-Humic Gley soils developed on coarse-textured wave-washed glacial till and beach deposits. In most places the coarse-textured material grades, at depths of 3 or 4 feet, to normal, firm, alkaline or calcareous, medium-textured glacial till. The glacial till underlying the Coveytown soils was derived mainly from Potsdam sandstone, but partly from Beekmantown limestone.

The Coveytown soils occur in the northern part of the county on the gently sloping smooth till plain. They are associated with soils of the Trout River, Fahey, and Cook series. The Coveytown soils resemble the Massena, Brayton, and Walpole soils. They are much coarser textured, however, than the Massena and Brayton soils, and they are much more heterogeneous in particle size than the Walpole soils, although the textural classes of the soils overlap.

Typical profile (Coveytown stony loamy sand—undisturbed):

A_0 A dark-gray or black mor humus layer 3 to 4 inches thick; this horizon is absent in some places.

A_1 0 to 5 inches, dark-gray to black (10YR 4/1 to 2/1) stony loamy sand; generally contains numerous angular gravel-sized fragments; very weak coarse crumb or single grain; friable; medium to slightly acid; 4 to 6 inches thick; smooth clear lower boundary.

BG_1 5 to 14 inches, pale-brown to light brownish-gray (10YR 6/3 to 6/2) stony loamy sand; a few small faint brownish-yellow and brown mottles; single grain or very weak coarse blocky; very friable; medium to slightly acid; 3 to 12 inches thick; gradual wavy lower boundary.

BG_2 14 to 30 inches, brown (10YR 5/3) stony loamy sand; a few large distinct brownish-yellow mottles; very weak coarse blocky or single grain; friable; slightly acid to neutral; 12 to 24 inches thick; gradual lower boundary.

D 30 inches+, pale-olive to light olive-brown (5Y 6/3 and 2.5Y 6/4 to 2.5Y 5/4) stony sandy loam or fine sandy loam glacial till; weak medium platy or massive; firm; neutral to calcareous.

Range in characteristics: Depth to the D horizon ranges from 20 to 50 inches; texture of the solum, from loamy sand to sand; and stoniness, from nonstony (stoniness class 0) to very stony (stoniness class 4).

In areas that have a cradle-knoll microrelief of 16 to 20 inches, a somewhat poorly drained soil with a Podzol profile has developed on the knolls. This profile consists of a black A_1 horizon (0 to 4 inches); a pale-brown (10YR 6/3) A_2 horizon (4 to 6 inches); and a dark-brown (10YR 4/3) B horizon (6 to 9 inches). Underlying the B horizon is a BG_1 horizon that has the same characteristics as the BG_1 horizon of the adjacent typical Coveytown soils, which are predominantly poorly drained. This somewhat poorly drained soil constitutes as much as 20 to 35 percent of some Coveytown mapping units.

Small areas of Cook, Massena, and Brayton soils are the most common inclusions in the Coveytown mapping units. Some areas in which the texture of the surface layer is sandy loam, fine sandy loam, or loam are also included.

Relief: Nearly level to gently sloping.

Drainage: Surface runoff is slow to very slow; internal drainage is very slow. Permeability is moderate to rapid.

Native vegetation: Soft maple, elm, whitecedar, and occasionally some basswood, hard maple, and alder.

MAPPING UNITS

Two of the following mapping units are phases of soils in the Coveytown series; one is an undifferentiated group of Coveytown soils.

Coveytown cobbly loamy sand, 0 to 6 percent slopes (Cfa; Group 11).

Coveytown gravelly loamy sand, 0 to 3 percent slopes (Cga; Group 11).—This soil occurs mainly on beach ridges that have low relief. It is associated with Trout River and gravelly Fahey soils.

Coveytown stony and very stony loamy sands, 0 to 6 percent slopes (Cha; Group 11).—Individual areas of this unit may be either stony or very stony, or may consist partly of stony and partly of very stony soil. The very stony areas have not been cultivated.

Covington Series

The Covington series is comprised of poorly drained Humic Gley soils that have developed on calcareous marine clays. The soils occur in the northwestern part of the county on level areas. They are associated with Panton and Livingston soils and with soils of the Grenville catena.

Except for the lack of a distinct A_2 horizon, the Covington soils resemble the Panton soil. Their surface horizon differs, but otherwise they resemble the very poorly drained Livingston soils. Also the Covington soils have a chroma of 1 or 2 as the base color of their subsoil instead of the 0 of the Livingston soils.

There is considerable evidence that the Covington soils were once very poorly drained Half-Bog or Humic Gley soils comparable to the Livingston soils. When the soils were developed for cultivation, the surface drainage may have improved. In such places an A_{1p} horizon replaces the A_0 horizon, the chroma increases in the subsoil, and the fine blocky structure becomes more evident.

Typical profile (Covington silty clay loam cultivated):

- A_{1p} 0 to 8 inches, very dark gray to very dark brown (10YR 3/1 to 2/2) silty clay loam; moderate to strong medium granular; somewhat friable to firm; plastic when moist; slightly acid to neutral; 6 to 10 inches thick; clear smooth lower boundary.
- G_1 8 to 11 inches, gray to dark grayish-brown (10YR 5/1 to 2.5Y 4/2) silty clay; numerous fine distinct yellowish-brown mottles; weak to moderate fine to very fine blocky; firm in place and plastic when moist; slightly acid to neutral; 3 to 7 inches thick; very dark gray material from the A_{1p} horizon extends downward into this horizon in wormholes and root channels; gradual smooth lower boundary.
- G_2 11 to 26 inches, moderate to strong fine to medium blocky silty clay; exteriors of peds are dark gray to gray (10YR 4/1 to 5/1) and interiors are olive brown or brown splotched with many fine, faint-gray mottles; firm in place and slightly sticky and plastic when moist; neutral; 10 to 20 inches thick; gradual lower boundary.
- G_3 26 to 36 inches, moderate medium or coarse blocky silty clay or clay; blocks are gray (10YR 6/1) on the exteriors and mottled olive brown and gray in the interiors; very firm in place and plastic when moist; neutral or calcareous; 8 to 12 inches thick; gradual lower boundary.
- C 36 inches +, gray (10YR 6/1) silty clay or clay; weak to moderate medium blocky structure; in places layer is mottled with olive brown; very firm in place and plastic; neutral to calcareous; lime segregated in small nodules in some places.

Range in characteristics: Texture of the surface layer of the Covington soils ranges from silt loam to silty clay. Locally the texture may be coarser where a thin layer of sandy material has been deposited on top of the surface soil. Areas that have surface textures different from the typical silty clay loam are included in the mapping units.

Reaction of the surface horizon ranges from pH 6 to pH 7. Depth to free carbonates ranges from 2 to 4 feet but is generally more than 3 feet. Except that locally the A_1 horizon may be only 2 to 4 inches thick, and that grayer colors dominate in the G_1 horizon, unplowed areas in woodland have profiles similar to the profile of plowed Covington silty clay loam described for the series.

Relief: Level to nearly level; slope generally less than 2 percent.

Drainage: Both surface runoff and internal drainage are very slow.

Native vegetation: Mainly ash, elm, and soft maple, but some red oak and whitecedar.

MAPPING UNITS

The following mapping units are phases of soils in the Covington series.

Covington silty clay loam, 0 to 2 percent slopes (Cka; Group 7).

Covington silty clay loam over till, 0 to 2 percent slopes (Cma; Group 7).—Firm calcareous glacial till occurs at depths of 20 to 36 inches in this soil. Some stones are generally present on the surface and throughout the profile.

Croghan Series

The Croghan soils are moderately well drained Podzols. They have developed on glaciofluvial sands derived mainly from Potsdam sandstone and granitic crystalline rock. The soils occur on deltas and on broad undulating sand plains. They are commonly associated with soils of the Adams, Au Gres, Walpole, and Scarboro series. They closely resemble the Adams and Wallace soils but are not so well drained.

Typical profile (Croghan loamy sand—undisturbed):

- A_0 Black mor humus layer held in a mat of fine roots; extremely acid; 3 to 5 inches thick; abrupt smooth lower boundary.
- A_2 0 to 4 inches, pinkish-gray (7.5YR 7/2) loamy sand; single grain; very friable; very strongly to extremely acid; 3 to 8 inches thick; abrupt irregular lower boundary.
- B_{2h} 4 to 5 inches, black to dark reddish-brown (5YR 2/1 to 3/2) loamy sand; very weak very fine crumb; friable, but locally moderately cemented; very strongly to extremely acid; 1 to 2 inches thick; clear irregular lower boundary.
- B_{2ir} 5 to 16 inches, dark reddish-brown (5YR 3/4), grading with depth to strong-brown (7.5YR 5/6), loamy sand; single grain and friable; discontinuously cemented into a hard massive ortstein in some places; very strongly acid; 9 to 14 inches thick; gradual wavy lower boundary.
- B_3 16 to 30 inches, yellowish-brown (10YR 5/8, grading with depth to 10YR 5/4), medium sand; single grain; friable; strongly acid; 10 to 24 inches thick; both fine and moderately distinct strong-brown mottles are common; gradual lower boundary.
- C_g 30 inches+, pale-brown (10YR 6/3) medium sand, in most places distinctly mottled with yellowish brown in the upper part; single grain; friable; strongly acid.

Range in characteristics: The degree of cementation in the B horizon of the Croghan soils varies within short distances, but iron-cemented fragments generally occur. Although the C horizon is generally strongly acid, locally the pH is 6.0 or slightly higher. Texture of the upper part of the solum ranges, as a rule, from loamy sand to loamy fine sand; one mapping unit is sandy loam and one is fine sandy loam. Croghan soils occur in areas where the water table is naturally high. In some places, however, soil drainage is apparently restricted because of lenses of very fine sand or silt in the substratum.

Small areas of Adams, Wallace, and Au Gres soils are the most common mapping inclusions.

Relief: Nearly level to gently undulating.
Drainage: Surface runoff is medium to slow. Permeability is rapid, but a naturally high water table causes internal drainage to be slow during part of the year.
Native vegetation: Mainly aspen, white birch, beech, and maple in cutover areas. Dense thickets of gray birch are common on abandoned areas that were once cultivated.

MAPPING UNITS

The following mapping units are phases of soils in the Croghan series.

Croghan loamy sand, 0 to 3 percent slopes (Cna; Group 13).
Croghan loamy sand, 3 to 15 percent slopes (Cnb; Group 13).
Croghan loamy sand over clay, 0 to 3 percent slopes (Coa; Group 13).—This soil is underlain by gray calcareous clay at depths of 24 to 48 inches. Cementation in the B horizon is limited to occasional weakly cemented gravel-size aggregates. The B_3 horizon in many places is only slightly acid. The soil generally occurs in association with Covington soils and with neutral, moderately deep soils of the Walpole series.
Croghan fine sandy loam over clay, 0 to 6 percent slopes (Cpa; Group 13).—Except for the texture of the surface horizon, this soil resembles Croghan loamy sand over clay, 0 to 3 percent slopes. Mapped with it are some areas in which the surface horizon is a fine sandy loam.
Croghan sandy loam over till, 0 to 6 percent slopes (Cqb; Group 13).—This soil is underlain by medium-textured stony glacial till at depths of 24 to 36 inches. In many places the surface layer contains a few stones.

Dannemora Series

The Dannemora series is made up of poorly drained Low-Humic Gley soils developed on medium textured glacial till derived mainly from Potsdam sandstone. The soils occur on the smooth till plain. They are associated with Worth, Empeyville, Westbury, and Tughill soils. They differ from the Brayton soils in reaction and from the Ridgebury soils in composition of the parent material.

Typical profile (Dannemora stony fine sandy loam—cultivated):

- A_p 0 to 8 inches, very dark gray to very dark brown (10YR 3/1 to 2/2) stony fine sandy loam high in organic matter; weak fine crumb; friable; very strongly acid; 5 to 10 inches thick; clear smooth lower boundary.
- A_{2g} 8 to 16 inches, light brownish-gray (2.5Y 6/2) stony fine sandy loam; numerous prominent reddish-yellow and brownish-yellow mottles in the lower part; weak medium platy; firm in place, but friable when crushed; very strongly acid; 6 to 10 inches thick; clear smooth lower boundary.
- BG 16 to 32 inches, mottled olive-brown and grayish-brown (2.5Y 4/4 and 5/2) stony fine sandy loam or loam, generally higher in clay than the horizon immediately above; moderate medium and fine blocky approaching moderate thick platy; very firm in place, and peds firm when removed; peds irregularly coated with gray and with black manganese oxide; strongly acid; 15 to 20 inches thick; horizon resembles the fragipan horizon of Westbury soils; diffuse lower boundary.
- C 32 inches +, pale-olive or light yellowish-brown (5Y 6/3 or 2.5Y 6/4) stony fine sandy loam or sandy loam glacial till; weak medium to thick platy; very firm in place; medium to strongly acid.

Range in characteristics: Fine sandy loam, very fine sandy loam, and loam are the most common types in this series. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 3). In undisturbed forested areas the surface horizon is a thick mor humus layer, underlain by the A_{2g} horizon. Where the soil grades to soils of the Brayton series, the reaction, at depths between 30 and 36 inches, approaches pH 6.0.
Relief: Nearly level to gently sloping.
Drainage: Surface runoff is slow; internal drainage is slow to very slow.
Native vegetation: Soft maple, beech, and hemlock. A dense growth of hardhack and meadowsweet is typical on unimproved pastures.

MAPPING UNITS

In Franklin County the Dannemora soils have not been mapped separately; they are included in mapping units of the Westbury and Tughill series.

Duane Series

The Duane soils are moderately well drained Podzols. They have developed on coarse-textured glaciofluvial materials derived mainly from Potsdam sandstone and granitic rock. The soils occur mainly on the bottom-set beds of deltas and on outwash plains. The series is the moderately well drained member of the Colton or Constable-Duane-Walpole-Scarboro catena. Except that mottling occurs in the lower part of the B horizon, generally below 15 inches, the Duane soils resemble the Colton soils.

Typical profile (Duane gravelly sandy loam—undisturbed):

- A_0 A mor humus layer, 2 to 4 inches thick; very strongly to extremely acid.
- A_2 0 to 3 inches, gray or pinkish-gray (10YR 6/1 to 7.5YR 6/2) loamy sand; single grain; friable; very strongly acid; 2 to 4 inches thick.
- B_{21} 3 to 10 inches, reddish-brown to yellowish-red (5YR 4/3 to 4/6) gravelly sandy loam; weak very fine crumb; friable; in places contains moderately cemented aggregates of fine and medium-sized pebbles; very strongly acid; 4 to 8 inches thick; a dark reddish-brown accumulation of organic matter about 1 inch thick occurs in many places in the uppermost part of this horizon.
- B_{22} 10 to 15 inches, yellowish-brown (10YR 5/6) gravelly sandy loam or loamy sand; very weak crumb or single grain; friable; strongly acid; 5 to 10 inches thick; in some places slightly mottled in the lower part.
- B_{3g} 15 to 26 inches, yellowish-brown (10YR 5/4) gravelly loamy sand containing numerous distinct coarse yellowish-brown and strong-brown mottles; single grain; friable; strongly acid; 8 to 14 inches thick.
- C 26 inches +, gravelly sand mottled in about equal proportions with olive brown, strong brown, and dark yellowish brown; single grain, friable; strongly acid; mottling decreases with depth into the stratified sand and gravel.

Range in characteristics: Cultivation mixes the A_0, A_1, and A_2 horizons, and the upper part of the B_{21} horizon, to form a very dark grayish brown or very dark brown (10YR 3/2 to 2/2) sandy loam that has a weak crumb structure. Both gravelly and nongravelly sandy loam and loamy sand types occur. In Franklin County the nongravelly sandy loams and gravelly loamy sands are included in the gravelly sandy loam mapping units.
Relief: Nearly level to gently sloping.
Drainage: Surface runoff is slow. Permeability of the solum is rapid, but internal drainage is restricted by the naturally high water table, lenses of very fine sand or silt in the substratum, and slowly permeable glacial till at comparatively shallow depths below the solum.
Native vegetation: Either coniferous or deciduous forest.

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MAPPING UNITS

The following mapping units are phases of soils in the Duane series.

Duane gravelly sandy loam, 0 to 3 percent slopes (Daa; Group 13).—This is a moderately deep soil in which glacial till occurs at depths of 2 to 3 feet. In some places the lower part of the solum, immediately above the till, is medium to slightly acid.

Duane gravelly sandy loam, 3 to 8 percent slopes (Dab; Group 13).—Except for slope this unit is similar to Duane gravelly sandy loam, 0 to 3 percent slopes.

Duane cobbly sandy loam, 0 to 3 percent slopes (Dba; Group 13).—Some loamy sand is mapped with this soil.

Duane cobbly sandy loam, 3 to 8 percent slopes (Dbb; Group 13).—Some loamy sand is mapped with this soil.

Eel Series

Eel soils are not mapped separately in Franklin County. The mapping units in which they occur are described with the Podunk series.

Empeyville Series

The Empeyville soils are moderately well drained Podzols. In these soils a well-developed fragipan horizon occurs below the Podzol profile at a depth of about 20 inches. The soils have developed on medium-textured stony glacial till that was derived mainly from Potsdam sandstone but partly from Beekmantown limestone. They are associated with other members of the Worth-Empeyville-Westbury-Dannemora-Tughill catena. Empeyville soils resemble the Moira soils, but are medium to strongly acid at depths of 30 to 36 inches, whereas the Moira soils are slightly acid to neutral at that depth. The Empeyville soils differ from the Skerry soils in type of parent material.

Typical profile (Empeyville very stony very fine sandy loam—undisturbed):

- A_0 A black mor humus layer that contains some gray sand grains; extremely acid; 2 to 3 inches thick; abrupt smooth lower boundary.
- A_2 0 to 2 inches, pinkish-gray (5YR 6/2) to light-gray (10YR 7/2) very stony very fine sandy loam; single grain to very weak very fine crumb; friable; very strongly acid; 1 to 5 inches thick; abrupt wavy lower boundary.
- B_{2h} 2 to 3 inches, dark-brown to dark reddish-brown (7.5YR 3/2 to 5YR 3/2) very stony very fine sandy loam; very weak very fine crumb; friable; extremely acid; ½ to 1 inch thick. This layer is absent in some places; clear wavy lower boundary.
- B_{22} 3 to 12 inches, yellowish-red (5YR 4/6) to strong-brown (7.5YR 5/6) very stony very fine sandy loam that grades with depth to yellowish brown (10YR 5/6); weak fine crumb; friable; very strongly acid; 4 to 10 inches thick; clear wavy lower boundary.
- B_3 12 to 18 inches, yellowish-brown to dark-brown (10YR 5/4 to 4/3) stony very fine sandy loam; contains some fine and some medium distinct strong-brown mottles, which are most common in the lower part of the horizon; very weak medium blocky and breaks to weak fine crumb; friable; strongly acid; 5 to 10 inches thick; clear smooth lower boundary.
- A'_2 18 to 22 inches, pale-brown, brown, or grayish-brown (10YR 6/3, 5/3, or 5/2) stony fine sandy loam; weak to moderate thick platy; firm and brittle; strongly acid; generally has common fine and medium, distinct strong-brown mottles; 3 to 6 inches thick; clear smooth lower boundary.
- B'_2 22 to 48 inches, brown to dark grayish-brown (10YR 4/3 to 4/2) stony sandy loam or fine sandy loam; a few fine faint grayish and yellowish-brown mottles; weak to moderate medium or coarse blocky; very firm in place; peds firm and brittle; medium to strongly acid, but in many places slightly acid in the lower part; horizon generally contains slightly more clay than the A'_2 horizon; rock fragments have a thin gray deposit of silty material on their upper surfaces; 18 to 36 inches thick; diffuse lower boundary.
- C 48 inches +, light brownish-gray to brown (10YR 6/2 to 5/3) stony fine sandy loam to loamy sand; massive; firm in place; medium to slightly acid.

Range in characteristics: In cultivated areas the A_0, A_2, and the upper part of the B_2 horizon have been mixed to form a very dark grayish brown (10YR 3/2 to 3/3) friable very fine sandy loam that has a weak to moderate medium crumb structure. Fine sandy loam, very fine sandy loam, and silt loam types occur in complex patterns in many places, but the very fine sandy loam type is predominant. Surface stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 4). The structure and thickness of the fragipan varies with texture. Where the texture is fine sandy loam, the pan is moderately blocky and comparatively thick; where the texture is sandy loam, the pan in many places is nearly massive and comparatively thin. The A'_2 horizon is absent in some places, generally in the coarser textured material. Texture of the C horizon ranges from loamy sand to fine sandy loam, but this does not affect the properties of the solum significantly.

Areas of fine sandy loam and silt loam are included in the very fine sandy loam mapping units. Where the Empeyville soils extend northward and grade to the Moira soils, areas of Moira soils are included in the Empeyville mapping units. Some small areas that have a heavy loam or sandy clay loam B'_2 horizon are mapped with the Empeyville stony very fine sandy loams. In these profiles the characteristics of the A'_2 and B'_2 horizons grade toward those of the Gray-Brown Podzolic soils.

Relief: Nearly level to moderately steep. Empeyville soils occur most extensively on slightly convex slopes on the gently undulating till plain.

Drainage: Surface runoff is medium on the gently sloping phases. Internal drainage is slow.

Native vegetation: Maple, beech, yellow birch, hemlock, and some spruce and balsam. A dense growth of hardhack and meadowsweet is typical on unimproved pastureland.

MAPPING UNITS

The following mapping units are either phases of soils in the Empeyville series or undifferentiated groups consisting of Empeyville and other soils.

Empeyville stony very fine sandy loam, 0 to 3 percent slopes (Eaa; Group 1).—Some nonstony areas are mapped with this soil.

Empeyville stony very fine sandy loam, 3 to 8 percent slopes (Eab; Group 1).—Some nonstony areas are mapped with this soil.

Empeyville stony very fine sandy loam, 8 to 15 percent slopes (Eac; Group 1).

Empeyville very stony very fine sandy loam, 0 to 8 percent slopes (Ebb; Group 18).

Empeyville and Moira stony very fine sandy loams, 15 to 25 percent slopes (Ecd; Group 1).—These soils occupy the narrow slopes that border drainage channels. Some areas consist entirely of Moira soils and some entirely of Empeyville soils.

Empeyville and Moira very stony very fine sandy loams, 8 to 25 percent slopes (Edc; Group 18).

Fahey Series

The Fahey soils are moderately well drained weak Podzols. They have developed on coarse-textured beach deposits and wave-worked till that were derived mainly from Potsdam sandstone but partly from Beekmantown limestone. On beach terraces they occur in association with the well-drained Trout River soils. In areas of wave-worked till, they occur in association with the Coveytown and Cook soils. Except that they have less strongly developed Podzol A_2 and B horizons and a different reaction in their B_3 and C horizons, the Fahey soils resemble the Duane soils.

Typical profile (Fahey gravelly loamy sand—undisturbed):

- A_0 A black mor humus layer 1 to 3 inches thick; generally strongly acid; smooth abrupt lower boundary.
- A_2 0 to 1½ inches, light brownish-gray to light-gray (10YR 6/2 to 7/2) gravelly loamy sand; single grain; loose; strongly acid; 1 to 3 inches thick; abrupt wavy lower boundary.
- B_{21} 1½ to 8 inches, strong-brown (7.5YR 5/6) gravelly loamy sand that grades with depth to yellowish brown (10YR 5/6 to 5/8); loose single grain; strongly acid to medium acid; 6 to 8 inches thick; gradual wavy lower boundary.
- B_{22} 8 to 16 inches, yellowish-brown (10YR 5/6) gravelly loamy sand or gravelly sand; single grain; loose; strongly acid to medium acid; in some places a few medium faint yellowish-brown and strong-brown mottles in the lower part; gradual lower boundary.
- B_3 16 to 26 inches, yellowish-brown (10YR 5/6) gravelly loamy sand or sand; single grain; loose; strongly acid to slightly acid; both faint and distinct yellowish-brown and strong-brown mottles are common; 6 to 12 inches thick; gradual lower boundary.
- C 26 inches +, brown or pale-brown (10YR 5/3 to 6/3) gravelly sand consisting of well-rounded grains; slightly acid to neutral.

Range in characteristics: In cultivated areas the A_0 and A_2 horizons and the upper part of the B horizon have been mixed to form a dark grayish brown to very dark grayish brown (10YR 4/2 to 3/2) gravelly loamy sand; texture of the plow layer ranges from loamy coarse sand to sandy loam. Soil reaction is generally strongly acid throughout the solum, but medium acid (pH 5.8 to 6.0) at depths of about 36 inches. It may be slightly acid in the B_{22} horizon in some profiles and neutral below. The C horizon is never calcareous in these soils. Some soils within the range of the Duane series are included in the Fahey mapping units. Stoniness in the Fahey soils ranges from nonstony (stoniness class 0) to very stony (stoniness class 3). Some areas that have fine sandy loam surface horizons are included in the mapping units.

Relief: Level to undulating.

Drainage: Surface runoff is slow. Permeability of the solum is rapid, but internal drainage is impeded by slowly permeable glacial till that occurs in most places at depths of 3 to 5 feet.

Native vegetation: Mainly sugar maple, beech, and birch, with some soft maple, elm, and aspen.

MAPPING UNITS

The following mapping units are either phases or undifferentiated groups of soils in the Fahey series.

Fahey gravelly loamy sand, 0 to 3 percent slopes (Faa; Group 13).

Fahey gravelly loamy sand, 3 to 8 percent slopes (Fab; Group 13).

Fahey cobbly and stony loamy sands, 0 to 3 percent slopes (Fba; Group 13).—Some areas of this mapping unit consist of cobbly soil and some of stony soil. The cobbly soil generally occurs on beach terraces and is associated with the Trout River soils. The stony soil is generally associated with the stony Coveytown soils.

Fahey cobbly and stony loamy sands, 3 to 8 percent slopes (Fbb; Group 13).—Except for slope this unit resembles Fahey cobbly and stony loamy sands, 0 to 3 percent slopes.

Fahey very stony loamy sand, 0 to 8 percent slopes (Fcb; Group 18).—This soil occurs only on areas of wave-worked till. It is generally associated with areas of very stony Coveytown soil.

Genesee Series

Genesee soils are not mapped separately in Franklin County. The mapping units in which they occur are described with the Ondawa series.

Grenville Series

The Grenville soils are well-drained Brown Forest soils. They have developed on highly calcareous glacial till that was derived mainly from Beekmantown limestone, but to a small extent from sandstone and granitic rock. The Grenville soils occur in the northwestern part of the county. They occupy undulating to rolling till ridges that rise above the level deposits of marine clay. The soils are generally associated with other members of the Grenville-Hogansburg-Massena-Sun catena and with Covington soils.

Typical profile (Grenville stony loam—undisturbed):

- A_1 0 to 6 inches, very dark brown to very dark grayish brown (10YR 2/2 to 3/2) stony loam; moderate fine to medium granular; friable; slightly acid to neutral; 4 to 8 inches thick; clear smooth lower boundary.
- B_2 6 to 14 inches, brown, strong-brown, or reddish-brown (7.5YR 4/4, 5/6, or 5YR 4/3) stony loam; color grades with depth to yellowish brown or brown (10YR 5/4 to 4/3); weak to moderate fine crumb that grades to very weak medium blocky; friable; neutral; 6 to 10 inches thick; gradual smooth lower boundary.
- B_3 14 to 22 inches, brown to yellowish-brown (10YR 4/3 to 5/4) stony loam or fine sandy loam; weak fine crumb, tending in places toward weak medium blocky; friable; neutral or weakly calcareous; 6 to 10 inches thick; gradual lower boundary.
- C 22 inches +, dark grayish-brown to light olive-brown (2.5Y 4/2 or 5/2 to 5/4) stony and gravelly fine sandy loam or loamy fine sand; weak thin platy or very weak medium blocky, or nearly massive; firm in place but friable when disturbed; calcareous.

Range in characteristics: In cultivated fields the plow layer is commonly dark brown or very dark brown. Loam is the predominant soil type, but some areas of fine sandy loam, silt loam, and sandy loam are included in the Grenville mapping units. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 4). Channery and flaggy limestone fragments are abundant in the parent material in many places. Reaction of the solum ranges from neutral to slightly acid. In some places a brown horizon, 2 or 3 inches thick and slightly but consistently higher in clay than adjacent horizons, occurs between the B_3 and C horizons. This horizon appears to be genetically related to the B_2 horizon that occurs in the Kars soils immediately above the calcareous gravel.

In some places small areas of Kars stony loam are included in the Grenville mapping units.

Relief: Gently undulating to rolling.

Drainage: Surface runoff and internal drainage are medium.

Native vegetation: Deciduous forest consisting of sugar maple, hophornbeam, basswood, ash, butternut, and elm.

MAPPING UNITS

The following mapping units are either phases of soils in the Grenville series or undifferentiated groups consisting of Grenville and other soils.

Grenville stony loam, 2 to 8 percent slopes (Gab; Group 4).—Some areas of nonstony soil are included in this mapping unit.

Grenville stony loam, 8 to 15 percent slopes (Gac; Group 4).—Some areas of nonstony soil are included in this mapping unit.

Grenville and Hogansburg very stony loams, 2 to 8 percent slopes (Gbb; Group 18).—Most areas of this mapping unit contain both Grenville and Hogansburg soils. Some areas consist of only one of the soils.

Grenville and Hogansburg very stony loams, 8 to 25 percent slopes (Gbc; Group 18).

Hermon Series

The Hermon soils are well-drained Podzols in which a weakly developed fragipan horizon occurs below the Podzol profile at a depth of about 2 feet. They have developed on coarse-textured glacial till derived mainly from granitic rock. The soils occur in the Adirondack section of Franklin County on areas of undulating to steep relief. They are associated with soils of the Becket, Skerry, Ridgebury, and Whitman series. Except for the nature of their parent material, the Hermon soils resemble the Worth soils closely. They resemble the Becket soils except that the fragipan horizon is not strongly developed in the Hermon series.

Typical profile (Hermon stony sandy loam—undisturbed):

A_0 A black to very dark brown, extremely acid mor humus layer 2 to 4 inches thick; abrupt smooth lower boundary.

A_2 0 to 3 inches, pinkish-gray to brown (7.5YR 6/2 to 5/2) stony loamy sand; very weak fine crumb or single grain; friable; extremely acid; 2 to 6 inches thick; abrupt wavy lower boundary.

B_{2h} 3 to 4 inches, dark reddish-brown to very dark brown (5YR 2/2 to 10YR 2/2) stony sandy loam; weak very fine crumb; friable; very strongly to extremely acid; ½ to 1½ inches thick; clear wavy lower boundary.

B_{22} 4 to 13 inches, dark reddish-brown, brown, or strong-brown (5YR 3/4, 7.5YR 4/4, or 7.5YR 5/6) stony sandy loam; weak fine crumb; friable; slippery feel when moist suggests high organic-matter content; very strongly acid; 6 to 12 inches thick; gradual wavy lower boundary.

B'_2 13 to 42 inches, brown (10YR 4/3 to 5/3) or grayish-brown (2.5Y 4/3 to 5/3 stony loamy sand; weak medium to thick platy; firm in place, and peds firm and brittle when removed; strongly acid; structure and consistence of horizon change gradually with depth; in uppermost 6 inches, practically all of the soil material is aggregated into firm peds; with increasing depth less of the material is aggregated, until in the lower part of the horizon about 75 percent of the soil material has a single grain structure and is friable; structure and consistence vary considerably with moisture content; on dry exposures the material is moderately to strongly platy and firm to very firm, but on fresh moist exposures the material is weakly platy, in many places nearly massive, and firm; rock fragments have a thin coating of gray silty material on their upper surfaces; layer is 14 to 30 inches thick; diffuse lower boundary.

C_1 42 inches +, grayish-brown to pale-brown (10YR 5/2 to 6/3) stony loamy sand; massive and somewhat firm in place; single grain and friable when removed; strongly acid; rock fragments in the upper part have thin gray silty coatings on their upper surfaces.

Range in characteristics: Plowing mixes the A_0 and A_2 horizons, and the upper part of the B_2 horizon, to form a dark grayish-brown to brown horizon with medium to fine crumb structure. Sandy loam, fine sandy loam, and loam Hermon soils occur in Franklin County. The loam occurs mainly in the northernmost fringe of the Adirondack Mountains. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 4). In the southern part of the county, soils that have developed on till derived mainly from anorthosite are included in the Hermon series, because their characteristics do not vary significantly from the profile described above.

The Hermon soils vary considerably in the degree of development of the fragipan horizon. At one extreme are soils that have practically no fragipan. In these soils the material below the Podzol profile is somewhat firm or friable and is structureless; the soils are not extensive and generally occupy very small areas. At the other extreme are soils that have fragipan horizons that resemble the strongly developed fragipans of the Becket series. Soils that have a very firm fragipan 2 feet thick are classified as Becket. Those in which the uppermost 4 to 6 inches of the fragipan is very firm and the lower 18 to 20 inches is firm, or somewhat firm, are classified as Hermon. Soils that have a modal Hermon profile, underlain at a depth of about 4 feet by extremely firm massive glacial till, may be classified in the Hermon series.

Relief: Undulating to steep.

Drainage: Surface runoff is medium to rapid. Internal drainage is medium.

Native vegetation: Maple, yellow birch, beech, hemlock, spruce, and white pine.

MAPPING UNIT

The following mapping unit is a phase of Hermon soil mapped in Franklin County.

Hermon stony sandy loam, 3 to 15 percent slopes (Hac; Group 2).—Areas of fine sandy loam and sandy loam Hermon soils and some Becket soils are the most common inclusions in this mapping unit.

Hogansburg Series

The Hogansburg soils are moderately well drained Brown Forest soils. They have developed on medium-textured highly calcareous glacial till derived mainly from Beekmantown limestone. The soils occupy ridges and low hills that rise above the marine clay flats in the northwestern part of the county. They are generally associated with other soils of the Grenville-Hogansburg-Massena-Sun catena.

Typical profile (Hogansburg stony loam—undisturbed):

A_1 0 to 6 inches, very dark gray to very dark grayish brown or very dark brown (10YR 3/1, 3/2, or 2/2) stony loam; moderate to strong medium granular; friable; slightly acid to neutral; 4 to 8 inches thick; clear smooth lower boundary.

B_2 6 to 15 inches, brown (7.5YR 4/4) stony loam; weak fine crumb or very weak medium blocky that breaks to weak fine crumb; friable; neutral to slightly acid; a few fine faint strong-brown and yellowish-brown mottles occur below 10 or 12 inches in some places; 4 to 12 inches thick; smooth gradual lower boundary.

B_3 15 to 20 inches, yellowish-brown (10YR 5/4) stony loam or fine sandy loam; some fine faint yellowish-brown or

strong-brown mottles; very weak medium blocky or weak fine crumb; friable; neutral; in some places weakly calcareous in the lower part; 4 to 10 inches thick; gradual lower boundary.

C_1 20 inches +, light olive-brown (2.5Y 5/4) stony fine sandy loam or sandy loam that grades with depth to grayish-brown (10YR 5/2); common medium distinct yellowish-brown or brownish-yellow mottles; weak thin or medium platy or nearly massive; firm in place, but friable when removed; highly calcareous.

Range in characteristics: The texture of the Hogansburg soils is fine sandy loam, loam, or silt loam. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 4). Depth to mottling ranges from 10 to 20 inches; depth to free carbonate, from 12 to 30 inches.

Relief: Nearly level to undulating and, in places, sloping.

Drainage: Runoff is medium; internal drainage is slow.

Native vegetation: Hard maple, hophornbeam, basswood, ash, elm, butternut, and some red oak. Scattered hawthorn bushes are the typical growth on unimproved pastures. Prickly-ash is a conspicuous constituent on brushy areas.

MAPPING UNIT

The following mapping unit is the only member of the Hogansburg series mapped in the county.

Hogansburg stony loam, 2 to 8 percent slopes (Hbb; Group 4).—Fine sandy loam and silt loam types of Hogansburg and some areas of Grenville soils are included in this mapping unit. Some areas of nonstony Hogansburg soil are also included.

Kars Series

The Kars soils are well-drained Brown Forest soils. They have developed on coarse-textured calcareous sands and gravel of Pleistocene age. These materials were derived mainly from Beekmantown limestone. The soils occur on small deltaic or outwash deposits and on beach ridges in the northwestern part of the county. They are generally associated with the soils of the Grenville catena.

Typical profile (Kars gravelly sandy loam—undisturbed):

A_1 0 to 3 inches, dark grayish-brown, dark-gray, or brown (10YR 4/2, 4/1, or 4/3) gravelly sandy loam; weak fine crumb; friable; slightly acid to neutral; 2 to 4 inches thick; clear smooth lower boundary.

B_1 3 to 12 inches, dark yellowish-brown to strong-brown (10YR 4/4 to 7.5YR 5/6) gravelly sandy loam; weak fine crumb; friable; neutral to slightly acid; 6 to 14 inches thick; clear wavy lower boundary.

B_2 12 to 21 inches, brown to dark-brown or dark yellowish-brown (7.5YR 4/4 to 10YR 4/3 or 4/4) gravelly loam or gravelly sandy loam containing slightly but consistently more clay than the horizon immediately above; generally weak to moderate fine crumb, but weak medium blocky in some places; friable; neutral; horizon extends as narrow V-shaped tongues into the horizon below; 10 to 24 inches thick; abrupt irregular lower boundary.

C 21 inches +, light brownish-gray or grayish-brown (2.5Y 6/2 or 5/2) calcareous sand and fine pebbles that are well sorted and stratified in some places and poorly sorted in others; fossil shells (*Saxacava rugosa*) are common in this horizon in many places, especially in the beach deposits.

Range in characteristics: Where the Kars soils are cultivated, the surface horizon is dark grayish brown and 5 to 7 inches thick. Both sandy loam and loam types occur in the series. In the loam types, the surface horizon generally has a moderate medium granular structure. Thickness of the solum ranges from as little as 14 inches to as much as 4 feet where tongues of the B_2 horizon extend downward into the substratum. The solum is typically neutral throughout, but areas in which the solum is slightly acid are included in the series.

The gravelly sandy loam generally occurs on small deltas or outwash plains in which the deposit is 10 to 15 feet thick. The cobbly and stony loams generally occupy beach ridges, where the gravelly deposit is commonly 4 to 6 feet deep. Some small areas of moderately well drained soils, in which the B_2 horizon is mottled, are included in the mapping units.

Relief: Nearly level to gently sloping.

Drainage: Surface runoff is slow; internal drainage is rapid.

Native vegetation: Hardwoods, including hard maple, beech, and basswood.

MAPPING UNITS

One of the following mapping units is a phase in the Kars series; the other is an undifferentiated group of Kars soils.

Kars gravelly sandy loam, 0 to 8 percent slopes (Kab; Group 8).—A few small narrow areas that have slopes of 8 to 15 percent are included in this unit.

Kars cobbly and stony loams, 0 to 8 percent slopes (Kbb; Group 8).—Individual areas of this mapping unit may be either cobbly or slightly stony (stoniness class 1). A few areas in which slopes are 8 to 15 percent and a few cobbly areas that have a sandy loam surface texture are included in the mapping unit.

Livingston Series

The Livingston soils are very poorly drained Half Bogs developed on fine-textured calcareous marine or lacustrine deposits. In the northwestern part of the county they occur in association with the Covington and Panton soils on broad clay flats. They also occur with the Madalin soils, generally in slight depressions where surface runoff is very slow.

Typical profile (Livingston silty clay loam—undisturbed):

A_0 0 to 12 inches, black (10YR 2/1) muck or silty muck; slightly acid to neutral; 6 to 18 inches thick; abrupt smooth lower boundary.

G_1 12 to 24 inches, gray (2.5Y 5/0) silty clay; very weak medium and coarse blocky approaching massive; firm and plastic when moist; some faint grayish-brown (2.5Y 5/2) and a few fine prominent strong-brown mottles; neutral; gradual lower boundary.

CG 24 inches +, grayish-brown (2.5Y 5/2) silty clay that contains many gray (2.5Y 5/0) mottles; weak coarse blocky approaching massive; firm and plastic; neutral to calcareous.

Range in characteristics: In partially drained areas and in cultivated areas the A_0 horizon is generally absent and the surface horizon is a very dark gray to black silty clay loam high in organic matter. The surface horizon is 6 to 12 inches thick and in many places has a weak medium granular structure. The Livingston soils resemble the Covington soils, but the subsoils are grayer and have weaker structure.

Relief: Level to nearly level.

Drainage: Surface runoff, internal drainage, and permeability are very slow.

Native vegetation: Red maple, elm, and black ash. Sedges, willow, alder, and scattered whitecedar are typical of unimproved cleared areas.

MAPPING UNITS

The following mapping units are phases of soils in the Livingston series.

Livingston silty clay loam, 0 to 2 percent slopes (Laa; Group 16).—This mapping unit includes soils in which firm medium-textured glacial till occurs at depths of 2 to 3 feet. Also included are some areas in which the surface texture is clay loam rather than silty clay loam.

Livingston stony clay loam, 0 to 2 percent slopes (Lba; Group 16).—This soil occurs in association with Madalin soils. It is coarser textured than the profile described in the series description. Texture of the subsoil ranges from silty clay loam to fine sandy clay. The soil is slightly to moderately stony (stoniness class 1). Areas of coarser textured soils that resemble the Sun soils are the most common mapping inclusions.

Livingston very stony clay loam, 0 to 2 percent slopes (Lca; Group 21).—Except for greater stoniness, this soil is similar to Livingston stony clay loam.

Madalin Series

The Madalin series consists of poorly drained Low-Humic Gley soils. These have developed mainly on moderately fine lacustrine deposits. Most of these soils occur on the smooth till plain at elevations of 500 to 700 feet. They are generally associated with other members of the Rhinebeck-Madalin-Livingston catena and with Brayton soils. The Madalin soils are coarser textured than the Covington and Panton soils and finer textured than the Brayton soils.

Typical profile (Madalin silt loam—cultivated):

- A_p 0 to 7 inches, very dark gray to grayish brown (10YR 3/1 to 5/2) heavy silt loam; weak to moderate medium crumb; firm when moist, slightly sticky and plastic when wet; slightly acid to neutral; 6 to 12 inches thick; clear smooth lower boundary.
- A_{2g} 7 to 10 inches, grayish-brown (2.5Y 5/2) heavy silt loam; in many places contains some fine faint yellowish-brown mottles; weak medium platy or moderate fine blocky; firm when moist, slightly sticky and plastic when wet; slightly acid to neutral; this horizon is absent in some places; 0 to 4 inches thick; clear smooth lower boundary.
- BG_1 10 to 24 inches, light olive-brown (2.5Y 5/4) mottled with common distinct gray (2.5Y 5/0 to 5/1) mottles; heavy silt loam or silty clay loam; moderate to strong medium blocky; very firm in place, sticky and plastic when wet; slightly acid to neutral; 10 to 16 inches thick; diffuse lower boundary.
- BG_2 24 to 40 inches, light yellowish-brown to light olive-brown (2.5Y 6/4 to 5/4) silty clay loam or heavy silt loam; weak to moderate medium blocky; firm in place, sticky and plastic when wet; neutral; diffuse lower boundary.
- C_1 40 inches +, dark grayish-brown to grayish-brown (10YR 4/2 to 2.5Y 5/2) silt loam to silty clay loam; weak to moderate, medium to coarse blocky; firm to very firm; generally neutral, but calcareous in some places.

Range in characteristics: Uncultivated areas of Madalin soils have a nearly black surface layer, 2 to 4 inches thick, underlain by the A_{2g} horizon described in the typical profile of cultivated Madalin silt loam. Both silt loam and silty clay loam types occur, but areas of silty clay loam are included in the silt loam mapping units. The profile generally contains numerous subangular pebble-size fragments of Beekmantown limestone and Potsdam sandstone throughout, but these are absent in some areas.

Stoniness ranges from nonstony (stoniness class 0) to very stony (stoniness class 3). The subsoil ranges in texture and structure from weakly blocky silt loam to moderately or strongly blocky silty clay loam. Variations in texture within these soil profiles are apparently caused by depositional differences in the parent material rather than by processes of soil formation. Some areas that are moderately acid in the upper part of the solum and slightly acid below 30 inches are included in the Madalin series. These areas resemble the profile described above in other respects.

The most common inclusions in Madalin mapping units are finer or coarser textured soils similar to the Covington or Brayton soils.

Relief: Nearly level.

Drainage: Both surface runoff and internal drainage are slow.

Native vegetation: Soft maple, elm, basswood, and whitecedar.

MAPPING UNITS

The following mapping units are phases of soils in the Madalin series.

Madalin silt loam, 0 to 2 percent slopes (Maa; Group 7).

Madalin stony silt loam, 0 to 2 percent slopes (Mba; Group 7).—Areas of very stony soils included in this mapping unit are indicated by symbols on the soil map.

Massena Series

The Massena soils are poorly drained Low-Humic Gley soils developed on medium-textured, stony, calcareous glacial till. They are members of the Grenville-Hogansburg-Massena-Sun catena, which occurs on the low till ridges in the northwestern part of the county. In the southernmost part of their area, Massena soils are in many places associated with Parishville and Moira soils. They are neutral throughout the solum, and calcareous material occurs within 3 feet of the soil surface; otherwise Massena soils resemble the Brayton soils.

Typical profile (Massena stony loam—undisturbed):

- A_1 0 to 5 inches, very dark brown (10YR 2/2) stony loam; weak medium subangular blocky that breaks to weak fine subangular blocky; friable; neutral; 4 to 6 inches thick; clear smooth lower boundary.
- BG_1 5 to 13 inches, olive-brown (2.5Y 4/4) light loam; contains some faint medium light olive-brown and strong-brown mottles; weak medium to coarse blocky; friable; neutral; 6 to 10 inches thick; gradual smooth lower boundary.
- BG_2 13 to 35 inches, olive (5Y 5/3) sandy loam; apparently massive in place but breaks to very weak medium and coarse blocky fragments; firm in place but friable when removed; numerous distinct medium-sized, light olive-brown and olive-yellow mottles; calcareous at depths of 20 to 28 inches; 18 to 26 inches thick; gradual lower boundary.
- C 35 inches +, dark grayish-brown (2.5Y 4/2) loam; strong medium and fine blocky structure; very firm and compact in place; calcareous.

Range in characteristics: Texture of the surface layer ranges from fine sandy loam to silt loam, and that of the BG_1 and BG_2 horizons, from sandy loam to loam. The BG_1 horizon ranges in color from olive brown to brown or yellowish brown (2.5Y 4/4 to 10YR 5/3 or 5/6). The structure of the surface horizon ranges from moderate

medium granular to weak medium blocky. Depth to calcareous material ranges from 16 to 30 inches. Surface stoniness ranges from class 1 to class 3.

Relief: Gently sloping to nearly level.

Drainage: Surface runoff is very slow to medium; internal drainage is slow.

Native vegetation: Mixed forest consisting mainly of maple, basswood, hemlock, white pine, and whitecedar.

MAPPING UNITS

The following mapping units are phases of soils in the Massena series.

Massena stony loam, 0 to 4 percent slopes (Mca; Group 5).—Some nonstony areas and some small areas that have slopes of 5 to 8 percent are included in this mapping unit.

Massena very stony loam, 0 to 8 percent slopes (Mdb; Group 19).

Moira Series

The Moira soils are moderately well drained Podzols that have a fragipan horizon below the Podzol profile. They have developed on medium-textured glacial till derived mainly from Potsdam sandstone but partly from Beekmantown limestone. In most places free carbonates have been leached from these soils to a depth of 5 feet or more.

Moira soils occupy slightly convex slopes on the smooth till plain. They are associated with soils of the Parishville, Brayton, and Sun series. They resemble the Empeyville soils, but have a pH of 6.0 at depths of 30 to 40 inches, while soils of the Empeyville series have a pH below 6.0 at the same depths. Moira soils differ from Skerry soils both in reaction of the lower horizons and in type of parent material.

Typical profile (Moira stony loam—undisturbed):

A_0	A black granular mor humus horizon, 2 to 4 inches thick; very strongly to extremely acid; abrupt smooth lower boundary.
A_2	0 to 2 inches, pinkish-gray (7.5YR 6/2 to 7/2) stony fine sandy loam; single grain; friable; very strongly acid; 1 to 4 inches thick; abrupt wavy lower boundary.
B_{21}	2 to 4 inches, dark-brown to dark reddish-brown (7.5YR 3/2 to 5YR 3/3) stony loam; weak very fine crumb; friable; very strongly acid; 1 to 3 inches thick; in some places a distinct, darker colored B_{2h} horizon about 1 inch thick occurs in the upper part of the B_2 horizon; clear wavy lower boundary.
B_{22}	4 to 12 inches, strong-brown to yellowish-brown (7.5YR 5/6 to 10YR 5/4) stony loam; weak very fine crumb; friable; very strongly acid; 6 to 12 inches thick; gradual wavy lower boundary.
B_3	12 to 24 inches, yellowish-brown (10YR 5/4) stony fine sandy loam or sandy loam; contains some fine faint brownish-yellow mottles and a few medium distinct strong-brown mottles; very weak fine crumb tending toward massive; friable; strongly acid; 8 to 16 inches thick; clear smooth lower boundary.
B'_2	24 to 50 inches, light olive-brown (2.5Y 5/4) stony loam or fine sandy loam; weak to moderate, medium to coarse blocky peds with brown to light olive-brown exterior and olive-brown interior (10YR 5/3 to 2.5Y 5/4 and 2.5Y 4/4); firm to very firm in place; clayflow surfaces on peds, indicative of clay deposition, occur in some places; slightly acid, but neutral in the lower part in some places; 18 to 36 inches thick; diffuse lower boundary.
C_1	50 inches +, grayish-brown (10YR 5/2 to 2.5Y 5/2) stony fine sandy loam or sandy loam; firm in place; slightly acid to neutral, but calcareous in places.

Range in characteristics: Plowing mixes the upper 6 or 7 inches to form a dark grayish-brown (10YR 4/2) loam of weak fine to medium blocky crumb structure. Some areas of fine sandy loam and silt loam are included in the loam mapping units. In some places a grayish-brown 2- to 3-inch (10YR 5/2 to 5/3) A'_2 horizon occurs immediately above the B'_2 horizon. Depth to mottling ranges from 10 to 18 inches. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 4).

Fragipan development in these soils varies. In some places weak pans similar to those of the Worth series occur. In others the pans are strong and resemble those of the Empeyville series. In general, the stronger fragipans occur where the parent materials are finer textured, and the weaker fragipans, where the parent materials are coarser textured. In the western part of the county, especially north of the villages of Moira and Brushton, the Moira mapping units include soils that have a sandy loam solum developed on wave-worked till. In this area soil texture ranges from sandy loam to silt loam within short distances, the fragipan is generally very weakly developed, and in many places calcareous material occurs at depths of 36 to 40 inches.

Relief: Nearly level to sloping.

Drainage: Surface runoff ranges from medium to rapid depending on slope. Internal drainage is slow. Permeability of the Podzol profile is moderate, but that of the fragipan is slow.

Native vegetation: Hardwood forest in which maple, beach, and hemlock are predominant.

MAPPING UNITS

The following mapping units are phases of soils in the Moira series.

Moira stony loam, 0 to 3 percent slopes (Mea; Group 1).—Some areas of nonstony soils are included in this mapping unit.

Moira stony loam, 3 to 8 percent slopes (Meb; Group 1).—Some nonstony soils are included in this mapping unit.

Moira stony loam, 8 to 15 percent slopes (Mec; Group 1).

Moira very stony loam, 0 to 8 percent slopes (Mfb; Group 18).

Muck Soils

The Muck soils of Franklin County are not classified into soil series. They consist of black to dark-brown well-decomposed deposits of organic matter derived mainly from woody materials. These deposits range from 18 inches to more than 6 feet in thickness and from strongly acid to slightly acid in reaction. In general the more strongly acid Mucks are associated with glacial drift that is low in lime, whereas the slightly acid Mucks are associated with glacial drift and marine deposits high in lime. Some organic deposits have been included in which the fine matrix is Muck, but in which there is a considerable proportion of only partially decomposed plant materials.

Relief: In Franklin County, Muck has developed only in depressional areas.

Native vegetation: The present forest vegetation consists predominantly of deciduous species that will tolerate very wet conditions. Sedges, rushes, and sphagnum are typical vegetation on cleared areas.

MAPPING UNITS

Two mapping units, differentiated by the thickness of the Muck, are shown on the soil map:

Muck, deep (Mga; Group 25).—This unit consists of Muck deposits that are more than 3 feet thick. Small amounts of shallow Muck are included in some of the larger areas.

Muck, shallow (Mha; Group 25).—This unit consists of Muck deposits that are 18 to 36 inches thick. Small areas of Half-Bog soils and deep Muck are included in some of the larger areas.

Nicholville Series

The Nicholville soils are moderately well drained Podzols. They have developed on glaciolacustrine deposits of fine sand and silt derived mainly from granitic rock and sandstone. The soils occupy broad smooth slopes of the till plain, where as a rule deposits of the parent material are comparatively thin. They also occur on rolling kamelike topography in the valley of the Salmon River south of Malone. The soils are members of the Salmon-Nicholville-Wallington-Birdsall catena and are generally associated with soils of those series. Small areas of Nicholville soils are in many places associated with soils of the Worth and Parishville catenas.

Typical profile (Nicholville fine sandy loam—undisturbed):

- A_0 A black mor humus horizon 2 to 3 inches thick; very strongly acid; abrupt smooth lower boundary.
- A_2 0 to 2½ inches, pinkish-gray to pinkish-white (7.5YR 7/2 to 8/2) fine sandy loam; single grain; friable; very strongly acid; 2 to 4 inches thick; abrupt irregular lower boundary.
- B_2 2½ to 16 inches, strong-brown (7.5YR 5/6) fine sandy loam; weak fine crumb tending in many places toward very weak fine blocky; friable; strongly acid; 10 to 16 inches thick; a distinct dark reddish-brown B_{2h} horizon, about 1 inch thick in many places, has developed in the uppermost part of this horizon but is generally not continuous horizontally; the lower part of the B_2 horizon is faintly mottled in some places; it has a gradual lower boundary.
- B_3 16 to 24 inches, fine sandy loam, yellowish brown in the upper part and grades to brown in the lower part (10YR 5/6 to 5/3) fine, common faint to distinct yellowish-brown and yellowish-red mottles; weak very fine crumb tending toward weak medium to coarse blocky; friable; strongly acid; 6 to 10 inches thick; gradual lower boundary.
- C_1 24 to 36 inches, yellowish-brown loamy fine sand; single grain; friable to slightly firm; strongly acid; 8 to 20 inches thick; gradual lower boundary.
- C 36 inches +, grayish-brown to pale-brown (2.5Y 5/2 to 10YR 6/3) fine sand, very fine sand, and silt that generally shows distinct stratification at depths of 4 to 5 feet; medium acid in the upper part, but neutral or calcareous in some places at depths below 5 feet.

Range in characteristics: Cultivation mixes the uppermost 6 or 7 inches to form a very dark grayish-brown (10YR 3/2) horizon with weak very fine to fine crumb structure. Texture of the solum ranges from fine sandy loam to very fine sandy loam, but fine sandy loam is predominant. Depth to mottling ranges from 14 to 24 inches. In some places the color of the B_2 horizon is yellowish brown rather than strong brown. Thickness of the solum ranges from about 22 to 36 inches. Members of the series that have glacial till at depths of 20 to 36 inches are important mapping units in Franklin County. Stoniness ranges from nonstony (stoniness class 0) to moderately stony (stoniness class 1). The stony areas are the most common where glacial till occurs at moderate depths.

Relief: Nearly level or gently undulating to sloping.

Drainage. Surface runoff is medium; internal drainage is medium to slow.

Native vegetation: Maple, beech, hemlock, and some spruce and white pine at higher elevations.

MAPPING UNITS

The following mapping units are phases of soils in the Nicholville series.

Nicholville fine sandy loam, 0 to 2 percent slopes (Naa; Group 6).—Some areas of this soil are slightly stony.

Nicholville fine sandy loam, 2 to 6 percent slopes (Nab; Group 6).—Some areas of this soil are slightly stony.

Nicholville fine sandy loam, 6 to 12 percent slopes (Nac; Group 6).—Some areas of this soil are slightly stony.

Nicholville stony fine sandy loam over till, 0 to 2 percent slopes (Nba; Group 6).—Except that firm medium-textured glacial till occurs at depths of 20 to 36 inches, this soil has a profile similar to the profile of Nicholville fine sandy loam—undisturbed, which is described for the series. Small areas of shallow (10 to 20 inches) soil over till are included in the mapping unit.

In some areas a horizon that resembles a fragipan occurs in the upper 12 to 18 inches of the glacial till, but the extent of this horizon is not known. Where observed, the horizon is brown (7.5YR 5/3 to 5/4) sandy loam or fine sandy loam that contains some mottles that are grayer and more yellowish than those in the typical profile. Structure is weak thin platy in the upper part but grades to weak thick platy and coarse blocky in the lower part. Consistence is firm in the upper part and grades to very firm in the lower part. The soil is hard and very brittle when dry. The peds are not well defined. The horizontal tops of the peds are the most distinct ped surface. Reaction ranges from medium to slightly acid.

Nicholville stony fine sandy loam over till, 2 to 6 percent slopes (Nbb; Group 6).

Nicholville stony fine sandy loam over till, 6 to 12 percent slopes (Nbc; Group 6).

Ondawa Series

The Ondawa soils are well-drained Alluvial soils on acid recent alluvium. They were derived mainly from granitic igneous rock and Potsdam sandstone. They occur on narrow first bottoms that border the larger streams in the county. The soils are members of the Ondawa-Podunk-Rumney-Saco soil catena. They closely resemble soils of the Genesee series but are medium to strongly acid rather than slightly acid to neutral.

In mapping, Ondawa soils have not been separated from Genesee soils in Franklin County. Genesee soils occur in the northwestern part of the county where the glacial drift is high in lime; Ondawa soils generally occur in the eastern and southern parts of the county where the amount of lime in the glacial drift is very small.

Typical profile (Ondawa fine sandy loam—cultivated):

- A_p 0 to 6 inches, dark grayish-brown or brown (10YR 4/2 to 4/3) fine sandy loam; weak very fine crumb; friable; medium to strongly acid.
- C 6 inches +, light yellowish-brown or brown (10YR 6/4 or 5/3) fine sandy loam; very weak fine crumb or massive; friable; medium to strongly acid.

Range in characteristics: Fine sandy loam is more common than other types of the Ondawa series, but areas of sandy loam, loam, and silt loam are included in the mapping units. In many places the texture varies rather extensively with depth. Very sandy or gravelly layers are common at depths of more than 2 feet.

Relief: Nearly level.
Drainage: Surface runoff is slow, and internal drainage is medium to rapid. All areas are subject to stream overflow and are usually flooded at least once in about 5 years.
Native vegetation: Elm, hard and soft maples, hophornbeam, willow, and alder are common species of trees.

MAPPING UNITS

The following mapping units are undifferentiated groups of Ondawa and Genesee soils.

Ondawa and Genesee fine sandy loams, 0 to 2 percent slopes (Oaa; Group 14).—Some areas of this mapping unit consist of Ondawa soil, others of Genesee soil. Fine sandy loam is the predominant soil type, but loam and silt loam are also common, especially in areas of Genesee soils. Areas of gravelly and cobbly soils are included in the mapping unit.

Ondawa and Genesee fine sandy loams, high bottoms, 0 to 2 percent slopes (Oba; Group 14).—These soils occur on alluvial terraces that are seldom flooded. They have somewhat more organic matter in the surface horizon and slightly browner colors immediately below the surface horizon than Ondawa and Genesee soils of the first bottoms. Some very weak Podzols, associated with the Ondawa soils, are included in this mapping unit.

Panton Series

The Panton soils, represented in Franklin County by Panton silty clay loam, 2 to 6 percent slopes, are poorly drained Low-Humic Gley soils developed on calcareous marine clays. They occur on level areas of marine clay in the northwestern part of the county. They are associated with soils of the Covington and Livingston series. These soils are better drained than the Covington soils. Also the surface horizon is more acid and contains less organic matter.

Typical profile (Panton silty clay loam—cultivated):

- A_p 0 to 5 inches, dark grayish brown to very dark gray (10YR 4/2 to 3/1) silty clay loam; moderate medium granular; friable; medium acid.
- A_{2g} 5 to 8 inches, gray (10YR 5/1) silty clay loam; contains some small distinct brown (10YR 5/3) mottles; moderate fine blocky; somewhat firm in place and plastic; medium to slightly acid.
- BG 8 to 26 inches, grayish-brown (10YR 5/2) in the upper part and contains a few small brown mottles (10YR 5/3); grades with depth to gray (10YR 6/1) with many prominent medium yellowish-brown mottles; silty clay; moderate medium and coarse blocky; firm in place and plastic; slightly acid to neutral.
- C 26 inches +, gray (2.5Y 5/1) silty clay or clay that contains some medium distinct brown mottles; moderate medium and coarse blocky; very firm in place; generally neutral above 3 feet, but calcareous in some places.

Range in characteristics: The A horizon ranges in texture from heavy silt loam to silty clay loam and in reaction from pH 5.6 to 6.2.
Relief: Level or nearly level.
Drainage: Surface runoff is slow to very slow. Internal drainage is slow.
Native vegetation: Deciduous forest of elm, soft maple, and black ash.

MAPPING UNIT

The following mapping unit is a phase of a soil in the Panton series.

Panton silty clay loam, 2 to 6 percent slopes (Paa; Group 7).—Some areas that have grayish-brown to brown (10YR 5/2 to 5/3) silt loam surface horizons are included in this mapping unit.

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Parishville Series

The Parishville soils are well-drained Podzols. They have developed on medium-textured glacial till derived mainly from Potsdam sandstone but partly from Beekmantown limestone. The soils occur on gently undulating parts of the smooth till plain and on steeper slopes adjacent to stream valleys. The Parishville series is the well-drained member of the Parishville-Moira-Brayton-Massena-Sun catena. Except that they have only a slightly acid reaction at a depth of 30 to 36 inches, the Parishville soils resemble the Worth soils.

Typical profile (Parishville stony loam—undisturbed):

- A_0 A mor humus horizon 1 to 3 inches thick; very strongly acid; abrupt smooth lower boundary.
- A_2 0 to 2 inches, pinkish-gray (7.5 YR 6/2) stony fine sandy loam; single grain or very weak very fine crumb; friable; very strongly acid; 1 to 3 inches thick; abrupt wavy lower boundary.
- B_2 2 to 12 inches, brown (7.5 YR 4/4 to 10 YR 4/3) stony loam that grades with depth to yellowish-brown fine sandy loam; weak fine crumb; friable; strongly acid; in many places the uppermost inch is dark reddish brown and high in organic matter; 6 to 12 inches thick; gradual wavy lower boundary.
- B_3 12 to 24 inches, yellowish-brown (10 YR 5/4 to 5/6) stony fine sandy loam; weak very fine crumb; friable; medium to strongly acid; 10 to 14 inches thick; clear smooth lower boundary.
- B'_2 24 to 36 inches, grayish-brown to light olive-brown (10 YR 5/2 through 2.5Y 5/2 to 2.5Y 5/4) fine sandy loam or sandy loam; weak medium to thick platy or weak coarse blocky; firm in place, and peds and fragments brittle; medium to slightly acid; 6 to 20 inches thick; diffuse lower boundary.
- C 36 inches+, light olive-brown to light brownish-gray (2.5Y 5/4 to 6/2) stony sandy loam; massive; firm in place, but friable when removed; slightly acid.

Range in characteristics: Cultivation mixes the uppermost 5 or 6 inches to form a dark grayish-brown (10 YR 4/2) layer that has a weak fine crumb structure. Loam, fine sandy loam, and sandy loam types occur. In some places the fragipan horizon is very weakly expressed or absent. Texture of the C horizon ranges from fine sandy loam to light sandy loam.

In the western part of the county, north of the villages of Brushton and Moira, Parishville soils that have sandy loam B horizons and that lack the fragipan horizons are common. These properties, however, are exceedingly variable over short distances. In the same area, the soils are calcareous at a depth of 3 feet in many places.
Relief: Undulating to steep. The moderately steep and steep phases are confined to narrow slopes adjacent to small stream valleys.
Drainage: Surface runoff is medium to rapid; internal drainage is medium.
Native vegetation: Predominantly maple, beech, and hemlock, but some white pine, spruce, and balsam.

MAPPING UNITS

The following mapping units are phases of soils in the Parishville series.

Parishville stony loam, 2 to 8 percent slopes (Pbb; Group 2).—In this soil texture of the plow layer ranges from loam to fine sandy loam. Some areas of sandy loam and of nonstony soil are included in the mapping unit.

Parishville very stony loam, 2 to 8 percent slopes (Pcb; Group 18).—Except for stoniness this soil resembles Parishville stony loam, 2 to 8 percent slopes.

Podunk Series

The Podunk soils are moderately well drained Alluvial soils. They occur on recent alluvium derived mainly from Potsdam sandstone and granitic rock. The soils occupy narrow first bottoms along the larger streams in the county. They are associated with the Ondawa, Rumney, and Saco soils. Although very similar to the Eel soils, the Podunk soils are medium to strongly acid, where the Eel soils are only slightly acid or neutral.

Podunk and Eel soils are not mapped separately in Franklin County. The Eel soils generally occur in the northern and western parts of the county, where the alluvium is derived from materials high in lime. The Podunk soils occur in the eastern and southern parts of the county, on alluvium derived from materials low in lime.

Typical profile (Podunk fine sandy loam—cultivated):

- A_p 0 to 6 inches, dark grayish-brown to brown (10YR 4/2 to 5/3) fine sandy loam; very weak fine crumb; friable; medium to strongly acid. This layer contains more organic matter than the underlying material.
- C 6 inches +, pale-brown to light brownish-gray (10YR 6/3 to 6/2) fine sandy loam; very weak very fine crumb or single grain; very friable; medium to strongly acid; distinct yellowish-brown and light-gray mottles occur below depths of 14 to 20 inches; very sandy or gravelly layers common at depths below 24 inches.

Range in characteristics: Fine sandy loam is the predominant type, but areas of loam and sandy loam are included in the mapping units. Texture of the subsoil is quite variable. Generally it is within the sandy loam to loam range.

Relief: Nearly level.

Drainage: Surface runoff is slow. The soil is rapidly permeable, but during the winter and spring, internal drainage is restricted by a high water table.

Native vegetation: Elm, red maple, willow, and alder are common species.

MAPPING UNITS

The following mapping units are undifferentiated groups consisting of Podunk and Eel soils.

Podunk and Eel fine sandy loams, 0 to 2 percent slopes (Pda; Group 14).—Individual areas of this unit consist of either Podunk soils or Eel soils. Except that they are only slightly acid or are neutral in reaction and are generally slightly finer in texture, the Eel soils are similar to the typical Podunk soil.

Podunk and Eel fine sandy loams, high bottoms, 0 to 2 percent slopes (Pea; Group 14).—These soils occur on the higher alluvial terraces adjacent to the larger streams in the county. Except that they are generally slightly browner (10YR 5/3 to 5/4) immediately below the A horizon, their characteristics are similar to those of the Podunk profile described for the series. The soils are sometimes flooded, but much less frequently than the Podunk and Eel soils of the first bottoms. Small areas of gravelly and cobbly soils are included in the mapping unit.

Rhinebeck Series

The Rhinebeck series consists of somewhat poorly drained Gray-Brown Podzolic soils developed on silty lacustrine deposits or lacustrine deposits that have been reworked by glacial ice. The soils occupy small nearly level or gently undulating areas on the smooth till plain. They are associated with Madalin, Livingston, Nicholville, Moira, and Empeyville soils.

Typical profile (Rhinebeck silt loam—cultivated):

- A_p 0 to 6 inches, dark grayish-brown to brown (10YR 4/2 to 4/3 or 5/3) silt loam; weak fine granular to moderate medium crumb; friable; medium to slightly acid; 5 to 7 inches thick; clear smooth lower boundary.
- A_{21} 6 to 11 inches, brown, yellowish-brown, or light yellowish-brown (10YR 5/3, 5/4, or 6/4) silt loam; slightly lower in clay than horizon above; weak fine to medium blocky that breaks to weak fine crumb; friable; medium to strongly acid; a few fine distinct yellowish-brown mottles occur in some places in the lower part; 2 to 10 inches thick; clear smooth lower boundary.
- A_{22} 11 to 18 inches, pale-brown or light yellowish-brown (10YR 6/3 or 2.5Y 6/4) silt loam lower in clay than the A_p or A_{21} horizon; distinctly mottled with yellowish brown and brownish yellow; weak thin platy or weak medium to fine blocky; friable or somewhat firm; medium acid; in some places this horizon extends 3 or 4 inches into the horizon below in narrow tongues 1 to 2 inches wide; clear lower boundary.
- B_2 18 to 36 inches, brown, grading with depth to dark grayish-brown (10YR 4/3 to 4/2), silty clay loam; compound structure of moderate coarse and very coarse prisms that consist of moderate to strong medium to coarse blocky peds; prisms have grayish-brown to light brownish-gray (2.5Y 5/2 to 6/2) very fine sandy loam or silt loam coatings that appear as vertical gray streaks up to ½ or 1 inch thick on a vertical section; the gray streaks have thin strong-brown or yellowish-brown borders; firm in place; plastic when wet; slightly acid; 14 to 24 inches thick; diffuse lower boundary.
- C 36 inches +, brown to grayish-brown (10YR 5/3 to 2.5Y 5/2) silt loam or silty clay loam, generally containing less clay than horizon immediately above; weak to moderate, medium and fine blocky; firm in place; generally slightly acid, but neutral or weakly calcareous in some places.

Range in characteristics: Texture of the surface horizon ranges from silt loam to very fine sandy loam, and texture of the B_2 horizon, from heavy silt loam to silty clay. In places the B_2 horizon grades downward into gray silty clay or clay at depths of 30 to 36 inches instead of into the C horizon as described above. Angular sandstone fragments, 2 to 5 inches in diameter, are common throughout the profile in many places, and some of the soils are slightly stony. Depth to the B_2 horizon ranges from 12 to 20 inches. In some places the A_{22} horizon is light gray or very pale brown (2.5Y 7/2 or 10YR 7/3 to 8/3).

Soil drainage in the Rhinebeck soils is somewhat poor to moderately good. The somewhat poorly drained soils, in which the A_{21} horizon is comparatively thin and the A_{22} horizon comparatively prominent, generally occur on nearly level slopes. Moderately well drained soils, in which the A_{21} horizon is comparatively thick and the A_{22} horizon comparatively thin, generally occur on gently convex slopes.

Relief: Nearly level to gently undulating.

Drainage: Surface runoff is slow to medium. Internal drainage is slow.

Native vegetation: Most areas of this soil have been cleared and planted to cultivated crops. Maple, beech, and hemlock are the most common species in the remaining woodlots.

MAPPING UNITS

The following mapping units are phases of soils in the Rhinebeck series.

Rhinebeck silt loam, 0 to 2 percent slopes (Raa; Group 9).—Small areas of Rhinebeck fine sandy loam and Nicholville fine sandy loam are the most common inclusions mapped with this soil.

Some areas of Rhinebeck soil, in which firm medium-textured glacial till occurs at depths of 28 to 40 inches, are also included.

Rhinebeck silt loam, 2 to 6 percent slopes (Rab; Group 9).

Ridgebury Series

The Ridgebury soils are poorly drained Low-Humic Gley soils. They have developed on glacial till derived mainly from granitic crystalline rock. The soils occur in the Adirondack Mountains section of the county on straight or slightly concave slopes of moderate gradient. They are associated with soils of the Hermon, Becket, Skerry, and Whitman series. The Ridgebury soils differ from the Dannemora in the nature of their parent material, and from the Brayton soils in reaction and in the nature of parent material.

Typical profile (Ridgebury stony sandy loam—undisturbed):

- A_0 A black granular mor humus layer 3 to 7 inches thick; very strongly acid; abrupt smooth lower boundary.
- A_{2g} 0 to 7 inches, light-gray to light brownish-gray (10YR 7/2 to 6/2) stony sandy loam; contains some medium faint pale-brown and some medium to coarse distinct reddish-yellow mottles; weak medium platy; friable; strongly acid; 5 to 8 inches thick; clear smooth lower boundary.
- BG_1 7 to 20 inches, brown to yellowish-brown (10YR 5/3 to 5/4) stony sandy loam; numerous distinct coarse light-gray and strong-brown mottles; moderate coarse blocky, grading with depth to moderate thick platy; compact; medium to strongly acid; 10 to 14 inches thick; gradual smooth lower boundary.
- BG_2 20 to 32 inches, light brownish-gray (10YR 6/2) stony sandy loam; a few faint yellowish-brown mottles; moderate to strong thick platy; very firm in place; medium to strongly acid; diffuse lower boundary.
- C 32 inches +, grayish-brown (10YR 5/2 to 2.5Y 5/3) stony sandy loam or loamy sand; structureless; firm in place, friable when removed; medium to strongly acid; mottled in some places.

Range in characteristics: Where cultivated the uppermost layer is very dark gray or very dark brown (10YR 3/1 to 2/2) and has a weak fine crumb structure. Sandy loam, fine sandy loam, and loam types occur, but the coarser types are most common. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 4). Although the entire profile is generally medium to strongly acid, some areas are included in which the reaction below 12 inches is only slightly acid. In some places the BG_2 horizon grades downward into grayish-brown, very firm, platy glacial till that is many feet thick.

Relief: Nearly level to sloping; slightly depressional in many places.

Drainage: Surface runoff is very slow to medium depending on slope. Internal drainage is slow. Permeability of the B horizon is slow, so that much water movement takes place as lateral subsurface seepage in the A horizon.

Native vegetation: Second-growth vegetation is commonly soft maple, aspen, white birch, and hemlock. Basswood and ash are common constituents in some places.

MAPPING UNITS

The following mapping units are phases of soils in the Ridgebury series.

Ridgebury stony sandy loam, 0 to 8 percent slopes (Rbb; Group 3).

Ridgebury very stony sandy loam, 0 to 10 percent slopes (Rcb; Group 19).

Rockland

Rockland is a miscellaneous land type. Rock outcrops and areas of very shallow soils are dominant. More than 25 percent of it consists of exposures of bare bedrock.

MAPPING UNIT

In Franklin County, Rockland is represented by only one mapping unit.

Rockland, sandstone and granite (Rd; Group 26).—Rock outcrops in this mapping unit consist of either Potsdam sandstone or granitic crystalline rock. Relief ranges from nearly level to steep.

Rumney Series

The Rumney series consists of poorly drained Low-Humic Gley soils, developed on recent alluvium derived mainly from Potsdam sandstone and granitic crystalline rock. The soils occur on nearly level flood plains in association with Podunk, Ondawa, and Saco soils. Rumney soils resemble the Wayland soils, but they differ mainly in being medium to strongly acid rather than slightly acid or neutral.

Typical profile (Rumney fine sandy loam—cultivated):

- A_P 0 to 7 inches, very dark gray to very dark grayish brown (10YR 3/1 to 3/2) fine sandy loam, high in organic matter; weak fine crumb; very friable; medium to strongly acid; contains a few fine distinct strong-brown mottles in some places; clear smooth lower boundary.
- C 7 inches +, light yellowish-brown (10YR 6/4) fine sandy loam; contains numerous distinct mottles of yellowish brown and light gray; structureless; very friable; medium to strongly acid; strata of sand and gravel common at depths below 20 inches.

Range in characteristics: Fine sandy loam is the predominant type, but loam and silt loam types are included in the mapping units.

Relief: Nearly level.

Drainage: Surface runoff is slow, and a high water table causes slow internal drainage. Permeability is moderate to rapid.

Native vegetation: Elm, willow, alder, and red maple.

MAPPING UNITS

The following mapping units are undifferentiated groups consisting of Rumney soils and Wayland soils.

Rumney and Wayland fine sandy loams, 0 to 2 percent slopes (Rea; Group 15).—Individual areas of this mapping unit consist either of Rumney soils or of Wayland soils. The Rumney soils occur in the eastern and southern parts of the county where the glacial drift is low in lime. Wayland soils occur in the northern and northwestern parts of the county in association with soils high in lime. Except that they are slightly acid to neutral in reaction the Wayland soils resemble the typical Rumney fine sandy loam described for the series.

Rumney and Wayland fine sandy loams, high bottoms, 0 to 2 percent slopes (Rfa; Group 15).—These soils occur on the higher stream terraces. They are flooded much less frequently than soils of the first bottoms. In other respects they resemble very closely the typical Rumney fine sandy loam.

Saco Series

The Saco soils, represented in Franklin County by Saco silt loam, are very poorly drained Humic Gley soils. They have developed on recent alluvium derived mainly

from Potsdam sandstone and granitic crystalline rock. They occur in association with Ondawa, Rumney, and Podunk soils adjacent to the stream channels.

Except for reaction, Saco and Sloan soils are very similar. In Franklin County they have been mapped together.

Typical profile (Saco silt loam—undisturbed):

A_1 0 to 8 inches, very dark gray to black (10YR 3/1 to 2/1) silt loam; a few fine distinct strong-brown mottles; very high in organic matter; weak fine crumb; very friable; medium to strongly acid; 6 to 12 inches thick; clear smooth lower boundary.

C 8 inches +, pale-olive (5Y 6/3) silt loam or fine sandy loam; numerous distinct yellowish-brown and light-gray mottles; structureless; somewhat firm in place, but friable when removed; in many places slightly sticky when wet; medium to strongly acid. Strata of sand and gravel are common at depths below 20 inches.

Range in characteristics: Fine sandy loam, loam, and silt loam types are common.

Relief: Nearly level.

Drainage: Surface runoff and internal drainage are both very slow.

Native vegetation: Alder, willow, some whitecedar, and rushes and sedges.

MAPPING UNIT

The following mapping unit is an undifferentiated group of Saco and Sloan soils.

Saco and Sloan soils, 0 to 2 percent slopes (Saa; Group 21).—An individual area of this mapping unit consists of either Saco soil or Sloan soil. As a rule the Sloan soil is associated with the Wayland soil in the northwestern part of the county. Except that they are slightly acid to neutral, these soils resemble the typical Saco silt loam described above.

Many small areas of Rumney and Wayland soils are included in this mapping unit.

Salmon Series

The Salmon soils are well-drained Podzols. They have developed on glaciolacustrine silts and fine sands that were derived mainly from Potsdam sandstone and granitic crystalline rock. The soils occur on rolling kamelike relief in the valley of the Salmon River and on the adjacent broad smooth till plain. They are generally associated with other members of the Salmon-Nicholville-Wallington-Birdsall catena and with soils of the Worth catena. The Salmon soils resemble Adams soils but have a much finer textured profile.

Typical profile (Salmon very fine sandy loam—undisturbed):

A_0 A granular mor humus horizon 2 to 4 inches thick; extremely acid; abrupt smooth lower boundary.

A_2 0 to 2 inches, pinkish-gray (7.5YR 7/2) loamy very fine sand; single grain; very friable; very strongly acid; 1 to 4 inches thick; abrupt wavy lower boundary.

B_2 2 to 15 inches, yellowish-red to strong-brown (5YR 4/6 to 7.5YR 5/8), grading with depth to yellowish brown (10YR 5/6), very fine sandy loam; weak very fine crumb; very friable; very strongly acid; in many places the uppermost 1 inch is dark reddish brown and high in organic matter; 10 to 15 inches thick; gradual lower boundary.

B_3 15 to 30 inches, yellowish-brown (10YR 5/6) loamy very fine sand or very fine sandy loam; single grain or very weak very fine crumb; friable; strongly acid; 12 to 20 inches thick; diffuse lower boundary.

C 30 inches +, stratified grayish-brown or light yellowish-brown (2.5Y 5/2 to 6/3) very fine sand and silt; somewhat firm in place but friable when removed; commonly medium acid in the upper part, but in some places slightly acid or neutral at a depth of 4 to 5 feet; this soil material may effervesce with acid at depths that range from 6 to 10 feet.

Range in characteristics: In cultivated areas the plow layer is dark grayish brown to very dark grayish brown (10YR 4/2 to 3/2) and has a moderate fine to medium crumb structure. Fine sandy loam and very fine sandy loam are the most common types, but some areas of coarse silt loam occur. Stoniness ranges from nonstony (stoniness class 0) to slightly stony (stoniness class 1). A moderately deep unit is mapped in which firm glacial till occurs at a depth of 20 to 30 inches. A weak fragipan horizon, about 10 inches thick, occurs in the upper part of the glacial till in some of the moderately deep phases.

Relief: Nearly level to steep.

Drainage: Surface runoff and internal drainage are medium.

Native vegetation: Maple-beech-hemlock hardwood forest.

MAPPING UNITS

All but one of the following mapping units are phases of soils in the Salmon series; one is an undifferentiated group consisting of Salmon soil and Nicholville soil.

Salmon very fine sandy loam, 0 to 2 percent slopes (Sba; Group 6).—Some slightly stony areas are included in this mapping unit.

Salmon very fine sandy loam, 2 to 6 percent slopes (Sbb; Group 6).

Salmon very fine sandy loam, 6 to 12 percent slopes (Sbc; Group 6).

Salmon stony very fine sandy loam over till, 0 to 2 percent slopes (Sca; Group 6).—Except that firm glacial till occurs below 20 or 30 inches, this soil resembles the profile of Salmon very fine sandy loam described for the series. Some nonstony areas are included in the mapping unit.

Salmon stony very fine sandy loam over till, 2 to 6 percent slopes (Scb; Group 6).

Salmon stony very fine sandy loam over till, 6 to 12 percent slopes (Scc; Group 6).

Salmon stony very fine sandy loam over till, 20 to 45 percent slopes (Sce; Group 22).—This mapping unit includes all of the steep areas of Salmon soils. Stony moderately deep soil is predominant, but some deep nonstony areas of Salmon, and some Nicholville soils, are included.

Salmon and Nicholville stony very fine sandy loams, 12 to 20 percent slopes (Sdd; Group 20).—Individual areas of this mapping unit consist of either Salmon or of Nicholville soil. Soils that are moderately deep over till, and nonstony soils, are included in the mapping unit.

Scarboro Series

The Scarboro soils are very poorly drained Half Bogs developed on glaciolacustrine and glaciofluvial sands. The soils occupy level sandy plains or bottom-set beds of deltas, generally in association with soils of the Walpole and Au Gres series. Soils of the Scarboro series differ from the Walpole soils in soil drainage. Also, the surface horizon is higher in organic matter, and the subsoil is more strongly gleyed.

Typical profile (Scarboro fine sandy loam—cultivated):

A_p 0 to 8 inches, black to very dark gray (10YR 2/1 to 3/1) fine sandy loam that contains a large amount of organic matter; weak fine crumb; very friable; medium to strongly acid; 6 to 10 inches thick; clear smooth lower boundary.

G_1 8 to 16 inches, light-gray to light brownish-gray (2.5Y 7/2 to 6/2) loamy sand or loamy fine sand; in many places a

few faint medium yellowish-brown mottles; single grain; friable; medium to strongly acid; 6 to 10 inches thick; gradual smooth lower boundary.

G_2 16 to 24 inches, pale-brown or pale-yellow (10YR 6/3 to 2.5Y 7/4) loamy sand or sand; generally some medium distinct yellowish-brown and strong-brown mottles; single grain; friable; medium to strongly acid; 8 to 12 inches thick; diffuse lower boundary.

C 24 inches +, light brownish-gray to light yellowish-brown (10YR 6/2 to 6/4) medium sand; single grain; friable; faintly mottled with yellowish brown in some places; medium to strongly acid.

Range in characteristics: In undisturbed areas the uppermost layer is nearly black muck and the underlying G_1 horizon has a chroma of 1. In some places thin lenses of clay, silt, or very fine sand occur in the subsoil and substratum. About one-third of the delineated areas of Scarboro soils has been partially drained, and the base color of the subsoil is higher in chroma than that of the Scarboro fine sandy loam profile described for the series. In these areas the subsoil is similar to that of the Walpole soils.

Relief: Nearly level to slightly depressed.

Drainage: Surface runoff is very slow. The soil profile is rapidly permeable, but a high water table causes very slow internal drainage.

Native vegetation: Second-growth vegetation generally consists of dense stands of gray birch or black spruce.

MAPPING UNITS

The following mapping units are phases of soils in the Scarboro series.

Scarboro fine sandy loam, 0 to 3 percent slopes (Sea; Group 17).—Small areas of gravelly sandy loam or loam, and some areas that are moderately deep over till, are included in this mapping unit. A few areas are included that have slopes of 6 to 8 percent. These occur on the foot slopes of deltas.

Scarboro loam, neutral variant, 0 to 3 percent slopes (Sfa; Group 17).—Except that it is neutral to slightly acid throughout, this soil resembles the profile of Scarboro fine sandy loam described for the series. The soil is bathed in ground water that is high in bases.

Scarboro loam, neutral variant, over till or clay, 0 to 3 percent slopes (Sga; Group 17).—Except that glacial till or marine clay occurs at depths of 20 to 40 inches, this soil resembles Scarboro loam, neutral variant, 0 to 3 percent slopes.

Skerry Series

The Skerry soils are imperfectly drained Podzols that have a fragipan at a depth of about 2 feet. They have developed on sandy glacial till derived mainly from granitic crystalline rock. The Skerry soils occur on gently sloping to rolling topography in the Adirondack Mountains section of the county. They are associated with Becket, Hermon, Ridgebury, and Whitman soils. Except for the nature of the parent material, the Skerry soils resemble soils of the Empeyville and Westbury series.

Typical profile: (Skerry stony sandy loam—undisturbed):

A_0 Very dark brown to black (10YR 2/2 to 2/1) mor humus horizon, 2 to 6 inches thick; very strongly acid; smooth abrupt lower boundary.

A_2 0 to 2½ inches, brown to pinkish-gray or grayish-brown (7.5YR 5/2 to 6/2 or 10YR 5/2) stony loamy sand; very weak fine crumb or single grain; friable; very strongly acid; 1 to 4 inches thick; abrupt wavy lower boundary.

B_{2h} 2½ to 3½ inches, dark reddish brown or very dark brown (5YR 2/2 or 3/2 to 10YR 2/2) stony sandy loam high in organic matter; weak to moderate fine crumb; friable; very strongly acid; ½ to 1 inch thick; clear wavy lower boundary.

B_{22} 3½ to 12 inches, dark reddish-brown to strong-brown (5YR 3/4 to 6YR 4/6) stony sandy loam; weak fine crumb; friable; occasional weakly cemented gravel-size aggregates; sufficient organic matter to produce a slippery feel if material is kneaded when moderately moist; some fine faint yellowish-red or yellowish-brown mottles in lower part; very strongly acid; 4 to 12 inches thick; gradual wavy lower boundary.

B_{3g} 12 to 24 inches, brown to yellowish-brown (7.5YR 4/4 to 10YR 5/6); numerous distinct fine and medium yellowish-red to strong-brown mottles; stony sandy loam or loamy sand; weak fine crumb to structureless; friable or slightly firm; strongly to very strongly acid; 8 to 14 inches thick; smooth clear lower boundary.

B'_{2g} 24 inches +, grayish-brown to olive-gray (10YR 5/2 to 5Y 5/2) stony loamy sand; weak thick platy to massive; very firm and hard when dry; peds and fragments firm and brittle when removed; mottling ranges from a few fine faint light yellowish-brown and dark-brown mottles to many fine to coarse distinct yellowish-brown and strong-brown mottles; strongly acid; generally structure is best developed in the upper part of the horizon; rock fragments have gray (10YR to 5Y, chroma 1 and 2) silty coatings up to 1.5 millimeters thick on their upper surfaces; the lower surfaces are clean; the fragipan horizon is a concentration of similar silty material that occurs in many places in the upper part of the peds. The lower boundary of the fragipan has not been observed, but it is generally more than 2 feet thick; the underlying till may be especially firm and difficult to distinguish from the fragipan in some cases.

Range in characteristics: Texture of the solum ranges from light loam to light sandy loam. Soil drainage ranges from moderately good to somewhat poor, but it is generally somewhat poor. In the better drained areas, the A_2 horizon is pinkish gray (7.5YR 7/2) and the B_{22} horizon is strong brown (7.5YR 4/6 to 5/6) and generally free of mottles. In the more poorly drained areas, the A_2 horizon generally has streaks of brown or dark-gray (7.5YR 4/2 or 10YR 4/1) organic matter near the upper and lower boundaries. The B_{22} horizon in many places has numerous medium and coarse distinct yellowish-brown and reddish-yellow mottles. Depth to the fragipan ranges from 18 to 30 inches. Plowing mixes the uppermost 5 or 6 inches to form a dark grayish-brown friable sandy loam to loam soil that has a weak fine crumb structure. The underlying glacial till appears to be similar to that underlying soils of the Becket series.

Relief: Gently undulating to moderately steep.

Drainage: Surface runoff is medium; internal drainage is slow.

Native vegetation: Mainly hardwoods such as sugar maple, beech, and yellow birch.

MAPPING UNITS

Skerry and Becket soils are mapped together in Franklin County. The mapping units in which the Skerry soils occur are listed and described under the Becket series.

Sloan Series

The only mapping unit in which Sloan soils occur in Franklin County is an undifferentiated group of Saco and Sloan soils and is described with the Saco series.

Stony Land

Stony land is a miscellaneous land type. Stones and boulders are so numerous that other soil characteristics are obscured. About 30 to 60 percent of the exposed surface is stone, but well-developed soil profiles generally occur in the spaces between the stones.

MAPPING UNITS

In Franklin County, Stony land is represented by the following mapping units:

Stony land, Hermon and Becket soils (Sh; Group 26).—This mapping unit consists of areas of stony land in which soil profiles, similar to those in the Hermon and Becket catena, have developed between the stones.

Stony land, Worth and Parishville soils (Sk; Group 26).—In most areas of this mapping unit, soils of the Worth or Parishville catenas occur between the stones.

Sun Series

The Sun soils are very poorly drained Humic Gley soils that have developed on medium-textured calcareous glacial till derived from Potsdam sandstone and Beekmantown limestone. The soils occur on the smooth till plain in association with Parishville, Moira, and Brayton soils. They also occupy local depressions in association with Grenville, Hogansburg, and Massena soils. Except that they are neutral throughout, the Sun soils resemble the Tughill soils. The Sun soils are finer textured than the Cook soils, although they resemble the Cook soils in other ways. The Sun soils are similar to soils of the Whitman series except for mineralogy and reaction.

The Sun soils occur in areas similar to those in which Half-Bog soils have developed, and in uncultivated areas they generally have a mucky surface soil.

Typical profile (Sun stony loam—undisturbed):

- A_1 0 to 7 inches, black to very dark gray (10YR 2/1 to 3/1) mucky stony loam or loam; generally contains some fine distinct reddish-brown mottles; weak fine crumb; friable; slightly acid to neutral; 4 to 10 inches thick; clear smooth lower boundary.
- G_1 7 to 15 inches, light-gray to gray (10YR 7/2 to 5Y 6/1) stony loam or fine sandy loam; many distinct small to medium yellowish-brown and light olive-brown mottles; very weak medium and fine blocky; firm in place, but friable when removed; slightly acid to neutral; 6 to 10 inches thick; gradual smooth lower boundary.
- G_2 15 to 33 inches, olive to pale-olive (5Y 4/3 to 6/3) stony loam or fine sandy loam; many faint to distinct coarse gray and olive-brown mottles; weak medium to coarse blocky; firm; slightly acid to neutral or calcareous in places below 15 or 20 inches; 15 to 20 inches thick; gradual lower boundary.
- C 33 inches +, pale-olive (5Y 6/3) stony fine sandy loam; medium thick platy or massive; firm to very firm; calcareous glacial till; sandstone and other rock fragments, 3 to 12 inches in diameter, are numerous throughout the profile.

Range in characteristics: Texture of the solum ranges from heavy loam to sandy loam. The thickness and organic-matter content of the A horizon vary considerably. Where the Sun soils are most nearly like bog soils, the A horizon is as much as 16 inches thick and consists of 8 to 10 inches of black muck over 6 to 8 inches of very dark gray loam or fine sandy loam. Where the soils grade to the acid Tughill soils, the uppermost 30 inches of the solum is slightly acid and the C horizon is neutral or alkaline, but not calcareous, at a depth of 3 feet.

In the better drained soils of this series, the G_1 horizon is thinner and its chroma in many places is as high as 3. As the soils approach bog conditions, the G_1 horizon is generally thicker and the colors of the G_2 horizon are grayer. The base color and degree of mottling in the subsoil are quite variable. Typically they have hues of 2.5Y or 5Y.

Relief: Level to very gently sloping.

Drainage: Surface runoff and internal drainage are very slow.

Native vegetation: Elm, soft maple, black ash, basswood, and whitecedar.

MAPPING UNITS

The following mapping units are phases of soils in the Sun series.

Sun stony loam, 0 to 5 percent slopes (Sma; Group 16).—Some areas of nonstony soil and some areas of sandy loam are included in this mapping unit.

Sun very stony loam, 0 to 5 percent slopes (Sna; Group 21).

Swanton Series

The Swanton series, represented in Franklin County by Swanton fine sandy loam, neutral variant, 0 to 3 percent slopes, consists of poorly drained Low-Humic Gley soils. The soils have developed on marine sands that are underlain by calcareous marine clay. They occur in the northwestern part of the county on broad marine flats and are generally associated with Covington and Walpole soils. Except that the solum is fine sandy loam rather than loamy sand, the Swanton soils resemble the Walpole soils.

Typical profile (Swanton fine sandy loam, neutral variant—cultivated):

- A_p 0 to 6 inches, dark-gray to very dark gray (10YR 4/1 to 3/1) fine sandy loam; weak very fine crumb; friable; slightly acid; 5 to 8 inches thick; clear smooth lower boundary.
- A_{2g} 6 to 10 inches, light brownish-gray (10YR 6/2) fine sandy loam; weak very fine crumb; friable; slightly acid; 0 to 4 inches thick; this horizon is absent or has been included in the plow layer in many places; clear smooth lower boundary.
- BG 10 to 24 inches, light brownish-gray to pale-brown (10YR 6/2 to 6/3) fine sandy loam; some faint medium yellowish-brown mottles; very weak medium blocky or medium coarse crumb; friable; slightly acid or neutral; 12 to 24 inches thick; abrupt smooth lower boundary.
- D 24 inches +, gray (10YR 5/1) neutral or calcareous marine clay.

Range in characteristics: Depth to the D horizon ranges from 18 to 40 inches. Fine sandy loam is predominant, but some areas of very fine sandy loam and loam are included in the mapping unit.

Relief: Nearly level.

Drainage: Both surface runoff and internal drainage are slow.

Native vegetation: Soft maple, elm, black ash, and hophornbeam.

MAPPING UNIT

The following mapping unit is the only soil of the Swanton series mapped in Franklin County.

Swanton fine sandy loam, neutral variant, 0 to 3 percent slopes (Soa; Group 10).

Trout River Series

The Trout River soils are well-drained weak Podzols. They have developed on coarse-textured beach terraces derived mainly from Potsdam sandstone, but to a small extent from limestone material. As a rule they are associated with soils of the Fahey and Coveytown series. The Trout River soils are similar to the Colton soils in texture, but they differ from them in degree of Podzol development and in reaction of the lower part of the soil profile.

Typical profile (Trout River gravelly loamy coarse sand—undisturbed):

- A_0 A medium to strongly acid mor humus layer 1 to 3 inches thick.
- A_1 0 to 1 inch, black gravelly loamy coarse sand; single grain or very weak fine crumb; loose to very friable; strongly to very strongly acid; 0 to 3 inches thick; abrupt smooth lower boundary.
- A_2 1 to 2 inches, light brownish-gray to pinkish-gray (10YR 6/2 to 7.5YR 7/2) gravelly loamy coarse sand; single grain; loose; strongly to very strongly acid; 0 to 3 inches thick; abrupt slightly wavy lower boundary.
- B_{21} 2 to 8 inches, strong-brown (7.5YR 5/6 to 4/4) gravelly loamy coarse sand; single grain or weak very fine crumb; loose; medium to strongly acid; 6 to 8 inches thick; gradual lower boundary.
- B_{22} 8 to 18 inches, brown to dark yellowish-brown (7.5YR 4/4 to 10YR 4/4) gravelly coarse sand; single grain; loose; medium to strongly acid; 8 to 12 inches thick; gradual lower boundary.
- B_3 C_1 18 to 30 inches, yellowish-brown (10YR 5/4) gravelly coarse sand; single grain; loose; medium to slightly acid; 6 to 18 inches thick; diffuse lower boundary.
- C 30 inches +, brown, yellowish-brown, or light yellowish-brown (10YR 5/3, 5/6, or 6/4) gravelly coarse sand; single grain; loose; slightly acid to neutral; the sand grains are mainly quartz, but some are feldspars and ferromagnesian minerals; gravel and cobblestones are mainly of Potsdam sandstone, but weathered Beekmantown limestone fragments and some crystalline rocks occur; neutral or calcareous glacial till generally underlies the beach deposits at depths that range from 6 to more than 10 feet.

Range in characteristics: The A_0 and A_2 horizons are absent in many areas of woodland, apparently as a result of grazing or other disturbance. The marked accumulation of organic matter in the upper part of the B horizon, which is a prominent characteristic of the stronger Podzols of the area, does not occur in the Trout River soils. In cultivated areas the surface horizon is dark brown or very dark grayish brown (10YR 3/3 to 3/2 or 7.5YR 3/2) and has a weak fine crumb structure. Sandy loam types occur, but they are included in the loamy sand mapping unit. Soils that have a Podzol profile, intermediate in characteristics between the Trout River and Constable soils, are mapping inclusions in some areas.

Relief: Nearly level to gently sloping.

Drainage: Surface runoff is slow; internal drainage is very rapid.

Native vegetation: Sugar maple, beech, birch, basswood, and some white pine and hemlock.

MAPPING UNITS

The following mapping units are phases of soils in the Trout River series.

Trout River gravelly loamy sand, 0 to 3 percent slopes (Taa; Group 12).

Trout River gravelly loamy sand, 3 to 8 percent slopes (Tab; Group 12).—A few areas having slopes of 8 to 15 percent are included in this unit.

Trout River cobbly loamy sand, 0 to 3 percent slopes (Tba; Group 12).

Trout River cobbly loamy sand, 3 to 8 percent slopes (Tbb; Group 12).—Some small areas having slopes of 8 to 15 percent are included in this unit.

Tughill Series

The Tughill series consists of very poorly drained Half Bogs. The soils have developed on medium-textured glacial till derived mainly from Potsdam sandstone. They occupy nearly level or slightly depressed areas on the smooth till plain. The soils are associated with Worth, Empeyville, Westbury, and Dannemora soils. The Tughill soils resemble the Sun soils, but they differ in reaction. They are similar to the Whitman soils, although they developed from parent material of different composition.

Typical profile (Tughill stony very fine sandy loam—undisturbed):

- A_0 Black or very dark brown well-decomposed muck, 4 to 12 inches thick; very strongly acid; clear smooth lower boundary.
- A_1 0 to 3 inches, black to dark-gray (10YR 2/1 to 4/1) stony very fine sandy loam high in organic matter; weak medium crumb that grades to weak medium blocky; slightly firm in place, but friable when disturbed; very strongly acid; 1 to 3 inches thick; clear smooth lower boundary.
- G_1 3 to 7 inches, grayish-brown to gray (10YR 5/2 to 5/1) stony fine sandy loam; common fine faint yellowish-brown mottles; very weak medium blocky or structureless; slightly firm in place, but friable when removed; strongly acid; 3 to 5 inches thick; gradual smooth lower boundary.
- G_2 7 to 32 inches, light brownish-gray (2.5Y 6/2) stony fine sandy loam; many pale-brown, brown, and yellowish-red mottles; variably weak coarse blocky or weak medium platy in the upper part, but grades to moderate medium and coarse platy in the lower part; very firm in place, and the peds and fragments are firm when removed; medium to strongly acid; 12 or more inches thick.

Range in characteristics: Where the soil has been disturbed by cultivation or by heavy grazing, the uppermost horizon is a very dark gray to very dark grayish brown mucky layer, 6 to 15 inches thick, that consists of mixed organic and mineral material. Some fine sandy loam, very fine sandy loam, and loam types occur. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 3).

Relief: Nearly level slopes or slight depressions.

Drainage: Both surface runoff and internal drainage are very slow.

Native vegetation: Elm, soft maple, hemlock, and some spruce and balsam.

MAPPING UNITS

The following mapping units are undifferentiated groups consisting of Tughill and Dannemora soils.

Tughill and Dannemora stony very fine sandy loams, 0 to 3 percent slopes (Tca; Group 16).—Some areas of this mapping unit consist entirely of Tughill soils and others entirely of Dannemora soils; some areas contain both. The Dannemora soils in the unit are the more poorly drained soils of that series. Areas of Tughill and Dannemora fine sandy loam and loam are included in the mapping unit.

Tughill and Dannemora very stony very fine sandy loams, 0 to 3 percent slopes (Tda; Group 21).—Except that it is more stony,

this unit resembles the stony very fine sandy loam group. Small areas that have slopes of 3 to 12 percent are included in the mapping unit.

Wallace Series

The Wallace soils resemble the Adams soils so closely that a detailed description is not given here. Except for the following variations, the description of the Adams series applies to Wallace soils. The B_{21r} horizon of the Wallace soils is cemented in a massive continuous ortstein that is hard when wet or dry. The B_{2h} horizon is generally cemented and forms the upper boundary of the ortstein. In some places there is no distinct B_{2h} horizon, but dark irregular patches of humus accumulation occur throughout the ortstein.

The Wallace soils in Franklin County have been included in mapping units of undifferentiated Adams and Wallace soils, which are described under the Adams series.

Wallington Series

The Wallington soils are poorly drained Low-Humic Gley soils. They have developed on fine sand and silt of lacustrine origin. These soils occupy nearly level areas in association with soils of the Salmon-Nicholville-Wallington-Birdsall catena. They are also associated with Westbury and Empeyville soils. Except for texture, the Wallington soils resemble the Walpole soils. They resemble the Swanton soils except for reaction.

Typical profile (Wallington very fine sandy loam—cultivated):

- A_p 0 to 7 inches, very dark brown (10YR 2/2) very fine sandy loam; high in organic matter; weak to moderate fine and medium granular; friable; strongly acid; clear smooth lower boundary.
- A_{2g} 7 to 11 inches, very fine sandy loam faintly mottled with light brownish gray and light gray (10YR 6/2 and 7/2) in equal proportions, but containing a few small distinct yellowish-brown mottles; weak fine to medium platy; friable; strongly acid; 3 to 6 inches thick; smooth clear lower boundary.
- BG_1 11 to 14 inches, very fine sandy loam, distinctly mottled with grayish brown and yellowish brown (2.5Y 5/2 and 10YR 5/8) in equal proportions; weak fine to medium platy; friable; strongly acid; 0 to 4 inches thick; gradual lower boundary.
- BG_2 14 to 33 inches, very fine sandy loam prominently and coarsely mottled with strong brown and light brownish gray (7.5YR 5/6 to 5/8 and 2.5Y 7/2 to 6/2); moderate medium and coarse platy; firm; strongly acid; 15 to 20 inches thick; gradual lower boundary.
- C 33 inches +, light yellowish-brown (10YR 6/4) very fine sand and coarse silt; many faint medium light-gray mottles; weak medium or thick platy; firm in place; medium to strongly acid; distinctly varved in some places.

Range in characteristics: Very fine sandy loam is more common than other types, but some areas of fine sandy loam and silt loam are included in the mapping units. In some areas the soil profile is slightly acid at deptns below 20 inches. Thin lenses of fine silt or clay occur in some places in the subsoil and substrata.

Relief: Nearly level.

Drainage: Both surface runoff and internal drainage are slow.

Native vegetation: Elm, soft maple, beech, aspen, and some hemlock and spruce.

MAPPING UNITS

The following mapping units are phases of soils in the Wallington series.

Wallington very fine sandy loam, 0 to 2 percent slopes (Waa; Group 10).—Small areas of soils similar to those in the Madalin series are included in this mapping unit. The soils are generally nonstony, but in some areas the surface is slightly stony.

Wallington stony very fine sandy loam, over till, 0 to 2 percent slopes (Wba; Group 10).—Except that firm glacial till occurs at depths of 20 to 36 inches, these soils have a profile resembling that of Wallington very fine sandy loam, which has been described for the series.

Walpole Series

The Walpole soils are poorly drained Low-Humic Gley soils developed on sandy glaciofluvial and glaciolacustrine deposits. They occur on smooth sand plains in association with other soils of the Adams catena. They also occur on outwash deposits and deltas in association with other soils of the Colton catena. Soils of the Walpole series differ from those of the Swanton series in texture of the solum. They differ from soils of the Scarboro series in the character of the surface horizon and intensity of gleying in the subsoil.

Typical profile (Walpole loamy sand—cultivated):

- A_{1p} 0 to 6 inches, very dark gray to very dark brown (10YR 3/1 to 2/2) loamy sand high in organic matter; very weak very fine crumb; friable; strongly acid; 5 to 8 inches thick; smooth clear lower boundary.
- A_{2g} 6 to 10 inches, grayish-brown to light brownish-gray or pale-brown (10YR 5/2, 6/2 or 6/3) loamy sand; some small faint yellowish-brown mottles occur in many places; single grain; friable; strongly acid; 0 to 6 inches thick; horizon absent in many places; clear smooth lower boundary.
- BG 10 to 28 inches, pale-brown to brownish-yellow or yellowish-brown (10YR 6/3, 6/6, or 5/4) loamy sand or sand; generally some distinct yellowish-brown or strong-brown mottles; single grain; friable; medium to strongly acid; 15 to 24 inches thick; diffuse lower boundary.
- C_1 28 inches +, light yellowish-brown to light brownish-gray (10YR 6/4 to 6/2) loamy sand or sand; single grain; friable; medium to strongly acid; faintly mottled with yellowish brown in some places; horizon moderately gravelly in some places, and a few gravel fragments in the solum are common.

Range in characteristics: Loamy sand and sandy loamy types are predominant in Franklin County, but finer textured variations occur, generally as a result of differences in the parent material. Texture of the subsoil and C horizon is loamy sand or sand. Neutral soils and soils moderately deep over glacial till or marine clay are included. Except for reaction of the neutral variants, these soils are smiliar to the typical soil described for the series.

Relief: Nearly level to very gently sloping.

Drainage: Surface runoff is slow. Permeability of the solum is rapid; but in the fall, winter, and spring, internal drainage is restricted by a high water table.

Native vegetation: Red maple, elm, white pine, and, especially on the neutral soils, some whitecedar and hophornbeam.

MAPPING UNITS

The following mapping units are either phases of soils in the Walpole series or undifferentiated groups consisting of Walpole and Au Gres soils.

Walpole sandy loam, 0 to 6 percent slopes (Wca; Group 11).—A few areas of gravelly sandy loam and gravelly loamy sand are included in this mapping unit.

Walpole fine sandy loam, neutral variant, 0 to 3 percent slopes (Wda; Group 10).—Except that the texture of the surface layer is different and the soil is neutral or slightly acid, the profile is similar to the profile of Walpole loamy sand described for the series.

Walpole loam, neutral variant, 0 to 3 percent slopes (Wea; Group 10).—A few large areas of this soil occur where a thin layer of fine material was deposited over the parent material that generally underlies the Walpole soils. In these areas thin layers of silt or clay are common in the subsoils and substratum. This soil is slightly acid to neutral throughout.

Walpole sandy loam, neutral variant, over till, 0 to 5 percent slopes (Wfa; Group 11).—In this soil firm alkaline or calcareous till occurs at depths of 20 to 36 inches below a solum that, except in reaction and texture of the surface soil, is similar to the typical Walpole loamy sand described for the series.

Walpole loamy sand, neutral variant, over clay, 0 to 3 percent slopes (Wga; Group 11).—In this soil neutral to calcareous marine clay occurs at depths of 20 to 36 inches below a solum that, except for reaction, resembles the Walpole loamy sand described for the series. This soil is slightly acid to neutral throughout.

Walpole and Au Gres loamy sands, 0 to 6 percent slopes (Wha; Group 11).—Some areas of this undifferentiated group consist entirely of Walpole soils, and other entirely of Au Gres soils; some areas include both soils.

Walpole, neutral variant, and Au Gres loamy sands, 0 to 6 percent slopes (Wka; Group 11).—Some areas of this mapping unit consist entirely of the neutral variant of Walpole, and some entirely of Au Gres loamy sands. Both of the soils occur in some areas.

Wayland Series

In this county Wayland soils are mapped only in undifferentiated groups with Rumney soils, and the mapping units are described under the Rumney series.

Westbury Series

The Westbury soils are somewhat poorly drained Podzols. They have a well-developed fragipan horizon below the Podzol profile. These soils have developed on medium-textured glacial till derived mainly from Potsdam sandstone. They are associated with other members of the Worth-Empeyville-Westbury-Dannemora-Tughill catena on the smooth till plain. Except for reaction of the lower subsoil, soils of the Westbury series resemble the Brayton soils. They resemble the Skerry soils except that they have developed from parent material of different composition.

Typical profile (Westbury stony very fine sandy loam—undisturbed):

- A_0 A black mor humus layer 2 to 4 inches thick; very strongly acid; abrupt smooth lower boundary.
- A_2 0 to 3 inches, pinkish-gray (5YR 6/2 to 7.5YR 6/2) stony very fine sandy loam; structureless; friable; very strongly acid; 1 to 5 inches thick; abrupt wavy lower boundary.
- B_2 3 to 8 inches, strong-brown to brown (7.5YR 5/6 to 10YR 4/3) very fine sandy loam; weak crumb; friable; strongly or very strongly acid; contains a few faint mottles in some places; if kneaded when moist it has a slippery feel that suggests a high organic-matter content; 3 to 6 inches thick; gradual lower boundary.
- B_3 8 to 16 inches, dark yellowish-brown to light olive-brown (10YR 4/4 to 2.5Y 5/4) stony very fine sandy loam that generally contains some faint medium or fine yellowish-brown mottles; very weak medium or coarse blocky structure that breaks to very weak fine crumb; friable; strongly acid; 6 to 12 inches thick; clear smooth lower boundary.
- A'_2 16 to 24 inches, light olive-brown to pale-olive (2.5Y 5/4 to 5Y 6/3) stony fine sandy loam; numerous faint yellowish-brown and strong-brown mottles; weak to moderate medium and thick platy, but in some places tending toward medium blocky; very firm in places; peds firm and brittle when removed; strongly acid; 0 to 10 inches thick; horizon is absent in some places, especially in coarser textured material, gradual lower boundary.
- B'_2 24 to 48 inches, brown (10YR 4/3 to 2.5Y 4/3) stony sandy loam or loam generally contains more clay than horizons above; very pale brown and dark brown mottles occur in a variable pattern, in some places as thin vertical streaks more than a foot long; weak medium to coarse blocky or thick platy; very firm in place, and peds are firm and brittle; strongly acid; thin gray silty coatings on the upper surfaces of rock fragments are characteristic in this horizon; 18 to 36 inches thick; diffuse lower boundary.
- C_1 48 inches +, pale-olive to light brownish-gray (5Y 6/3 to 2.5Y 6/2) stony fine sandy loam or sandy loam; structureless; firm to very firm in place but less compact than horizon above; medium to strongly acid. The till is commonly neutral or weak calcareous below depths of 7 to 10 feet.

Range in characteristics: The surface texture ranges from fine sandy loam to silt loam, but very fine sandy loam is predominant. Where cultivated the plow layer is dark grayish brown to very dark grayish brown (10YR 4/2 to 3/2) in color and of weak fine crumb structure. In some places the Podzol B_2 horizon contains weakly cemented gravel-size aggregates. Below a depth of about 30 inches, texture of the profile varies considerably without affecting significantly the upper part of the solum. Where this material is a light sandy loam, the fragipan is generally thin and has very weakly expressed structure; where it is fine sandy loam or loam, the fragipan is comparatively thick and structure is well developed.

Relief: Nearly level to sloping.

Drainage: Surface runoff ranges from slow to medium, depending on slope. Internal drainage is slow.

Native vegetation: Maple, beech, hemlock, and some elm and white pine. A dense growth of hardhack and meadowsweet is typical on many unimproved pastures.

MAPPING UNITS

The following mapping units are undifferentiated groups of Westbury and other soils.

Westbury and Brayton very stony very fine sandy loams, 8 to 15 percent slopes (Woc; Group 19).—This unit generally occurs on short slopes adjacent to drainage channels. Each area consists of either Westbury soils or Brayton soils.

Westbury and Dannemora stony very fine sandy loams, 0 to 3 percent slopes (Wma; Group 3).—Most areas of this mapping unit contain both Westbury and Dannemora soils, but some consist of only one of the soils. Some areas of nonstony soils are included in the mapping unit.

Westbury and Dannemora stony very fine sandy loams, 3 to 8 percent slopes (Wmb; Group 3).

Westbury and Dannemora very stony very fine sandy loams, 0 to 8 percent slopes (Wna; Group 19).

Whitman Series

The Whitman series, represented in Franklin County by Whitman very stony fine sandy loam, 0 to 8 percent slopes, consists of very poorly drained Half-Bog soils. These have developed on glacial till derived mainly from granitic crystalline rock. The Whitman soils occupy

slight depressions and gentle slopes that are kept wet by water seeping downward from higher areas. They are associated with soils of the Hermon, Becket, Skerry, and Ridgebury series in the Adirondack Mountains section of the county. The Whitman soils resemble the Tughill soils closely, but they differ from them mainly in nature of parent material.

Typical profile (Whitman stony fine sandy loam—undisturbed):

- A_0 Nearly black well-decomposed muck, 4 to 12 inches thick; strongly acid; clear smooth lower boundary.
- G_1 0 to 6 inches, grayish-brown to gray (2.5Y 5/2 to 6/1) stony fine sandy loam; generally contains some fine faint yellowish-brown mottles; very weak medium blocky or structureless; friable; medium to strongly acid; 5 to 12 inches thick; gradual lower boundary.
- G_2 6 to 18 inches, light-gray to gray (2.5Y 7/2 to 6/1) stony sandy loam or stony fine sandy loam; many medium distinct pale-brown and yellowish-brown mottles; weak coarse blocky, in some places grading to weak coarse platy in the lower part; firm in place but friable when removed. Medium to strongly acid; diffuse lower boundary.
- C 18 inches +, olive-gray to olive (5Y 5/2 to 5/3) stony fine sandy loam or sandy loam, faintly mottled in some places with yellowish brown; very weak thick platy, or nearly massive; firm to very firm in place but friable when crushed; medium to strongly acid.

Range in characteristics: Sandy loam, fine sandy loam, and loam types occur. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 3). Reaction of the solum is generally strongly acid to medium acid, but some areas of slightly acid soil are included.

Relief: Nearly level to gently sloping.

Drainage: Both surface runoff and internal drainage are very slow.

Native vegetation: Soft maple, hemlock, and some beech, elm, spruce, and balsam.

MAPPING UNIT

Whitman very stony fine sandy loam, 0 to 8 percent slopes, is the only member of the Whitman series mapped in Franklin County.

Whitman very stony fine sandy loam, 0 to 8 percent slopes (Wpa; Group 21).—Except for the stoniness of the surface horizon, this soil resembles the profile of Whitman stony fine sandy loam described for the series. Where the mucky surface horizon is comparatively thin, the A_p horizon is mucky loam in many places. This is because plowing has mixed the surface soil with the material of the underlying mineral horizon.

Worth Series

The Worth soils are well-drained Podzols that have a fragipan horizon below the Podzol profile. They have developed from glacial till derived mainly from Potsdam sandstone. The soils occur on slightly convex slopes of gently undulating to gently rolling topography in association with Empeyville, Westbury, Dannemora, and Tughill soils. They differ from the Parishville soils in being strongly acid in the lower solum and substratum, from the Hermon soils in mineral content of the parent material, and from the Becket soils in degree of development of the fragipan horizon and in composition of the parent material.

Typical profile (Worth stony fine sandy loam—undisturbed):

- A_0 A very dark brown to black very strongly acid mor humus layer 1 to 2 inches thick; abrupt smooth lower boundary.
- A_2 0 to 3 inches, pinkish-gray to light-gray (5YR 7/2 to 10YR 7/1) stony fine sandy loam; very weak very fine crumb; friable; very strongly acid; 1 to 5 inches thick; abrupt irregular lower boundary.
- B_{2h} 3 to 4 inches, dark reddish-brown (5YR 3/3 to 3/2) stony fine sandy loam; weak very fine crumb; friable; very strongly acid; 0 to 2 inches thick; horizon is absent in some places; clear irregular lower boundary.
- B_{2ir} 4 to 14 inches, strong-brown to dark-brown (7.5YR 5/6 to 4/4) stony fine sandy loam; weak medium to coarse crumb; friable; strongly acid; 6 to 12 inches thick; gradual wavy lower boundary.
- B_3 14 to 20 inches, yellowish-brown to dark yellowish-brown (10YR 5/6 to 4/4) stony fine sandy loam or sandy loam; very weak crumb or single grain; strongly acid; gradual lower boundary.
- B'_2 20 to 48 inches, grayish-brown to brown (10YR 5/2 to 5/3) stony sandy loam or loamy sand; weak medium blocky structure that grades in many places to thick platy; thin horizontal streaks of yellowish brown in many places between the peds; firm when moist, but peds firm, brittle, and hard when dry; strongly acid; 12 to 36 inches thick; diffuse lower boundary.
- C 48 inches +, light brownish-gray to pinkish-gray (10YR 6/2 to 7.5YR 7/2) stony loamy sand; somewhat firm in place but friable when removed; structureless; medium to strongly acid; this horizon shows rude stratification in some places.

Range of characteristics: Cultivation mixes the upper 5 to 7 inches to form a very dark grayish brown to dark brown (10YR 3/2 to 3/3) plow layer with a weak to moderate fine crumb structure. Surface texture ranges from sandy loam to fine sandy loam or very fine sandy loam, but fine sandy loam is predominant. Stoniness ranges from slightly stony (stoniness class 1) to very stony (stoniness class 4). Color of the Podzol B horizon ranges from reddish brown to dark yellowish brown. Thickness of the Podzol profile ranges from 16 to 30 inches, but the top of the fragipan horizon generally is between 18 and 22 inches.

The structure and consistence of the fragipan varies considerably with moisture content; when moist it is only firm or slightly firm and the structure is not apparent. When dry it is hard and the structure is well expressed. Texture of the fragipan and C horizon ranges from fine sandy loam or sandy loam to loamy sand. The fragipan is thicker and harder in the fine textured material. In the thickest fragipans the lower 18 to 24 inches is transitional to the C horizon. In soils on fine sandy loam tills, there is a distinct A'_2 horizon below the Podzol solum and above the fragipan, which is from 3 to 6 inches thick. This A_2 horizon is grayish brown in color (2.5Y 5/2 to 10YR 5/2 or 6/2) and generally has a weak to moderate medium platy structure. The A'_2 horizon is absent in most places. As a rule the fragipan horizon is slightly higher in clay content than horizons above and below it.

Relief: Nearly level to steep.

Drainage: Both surface runoff and internal drainage are medium.

Native vegetation: Maple, beech, hemlock, and white pine.

MAPPING UNITS

All but one of the following mapping units are phases of Worth soils; one is an undifferentiated group consisting of Worth and other soils.

Worth stony fine sandy loam, 0 to 3 percent slopes (Wqa; Group 2).—The uppermost 12 to 18 inches of some soils included in this mapping unit has developed on smooth fine sandy loam or very fine sandy loam similar in texture to that of the Salmon soils. A few small areas of soil over loam till are also included. In these the fragipan resembles the B horizon of Gray-Brown Podzolic soils and has a fairly distinct blocky structure and a definite increase in clay content.

Worth stony fine sandy loam, 3 to 8 percent slopes (Wqb; Group 2).

Worth stony fine sandy loam, 8 to 15 percent slopes (Wqc; Group 2).

Worth very stony fine sandy loam, 0 to 8 percent slopes (Wsb; Group 18).

Worth very stony fine sandy loam, 8 to 25 percent slopes (Wsd; Group 18).

Worth and Parishville soils, 25 to 60 percent slopes (Wte; Group 22).—Some areas of this unit consist of Worth soil and others of Parishville soil. Small areas of Empeyville and Moira soils are included. The soils are generally stony (stoniness class 1 or 2) and normally occur on slopes adjacent to drainage channels.

Engineering Applications [3]

This soil survey report for Franklin County, N. Y., contains information that can be used by engineers to—

1. Make soil and land use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
2. Make estimates of runoff and erosion characteristics for use in designing drainage structures and planning dams and other structures for water and soil conservation.
3. Make reconnaissance surveys of soil and ground conditions that will aid in the selection of highway and airport locations and in planning detailed soil surveys for the intended locations.
4. Locate sand and gravel for use in structures.
5. Correlate pavement performance with types of soil and thus develop information that will be useful in designing and maintaining the pavements.
6. Determine the suitability of soil units for cross-country movements of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs, for the purpose of making soil maps and reports that can be readily used by engineers.

The mapping and the descriptive report are somewhat generalized, however, and should be used only in planning more detailed field surveys to determine the in-place condition of the soil at the site of the proposed engineering construction.

Soil Science Terminology

Some of the terms used by the agricultural soil scientist may be unfamiliar to the engineer, and some words—for example, soil, clay, silt, sand, and aggregate—may have special meanings in soil science. These and other special terms that are used in the soil survey report are defined in the glossary on pp. 72.

Soil Test Data and Engineering Soil Classifications

To be able to make the best use of the soil maps and the soil survey reports, the engineer should know the physical properties of the soil materials and the in-place condition of the soil. After testing soil materials and observing the behavior of soils when used in engineering structures and foundations, the engineer can develop design recommendations for the soil units delineated on the maps.

Soil test data

Samples of the principal soil type of each of six extensive soil series were tested in accordance with standard procedures (*2*)[4] to help evaluate the soils for engineering purposes. The test data are given in table 5. Although each soil was sampled in two or three localities, the test data probably do not show the maximum range in physical test characteristics of the B and C horizons of each of the soil series. Except for the Worth soil, the samples were obtained at depths of less than 4 feet. The test data, therefore, may not be a suitable basis for estimating the characteristics of soil materials that will be encountered in deep cuts in rolling or hilly topography.

The engineering soil classifications in table 5 are based on data obtained by mechanical analysis and by tests to determine liquid limits and plastic limits. The mechanical analysis data for each soil sample identified in table 5 were obtained by a combination of sieve and hydrometer analyses. Percentages of clay obtained by the hydrometer method should not be used in naming soil texture classes.

The liquid-limit and plastic-limit tests measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a solid to a semisolid or plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a solid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 5 also give compaction (moisture-density) data for the tested soils. If a soil material is compacted at progressively higher moisture content, assuming that the compactive force remains constant, the density of the compacted material will increase until the "optimum moisture content" is reached; after that the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed the "maximum dry density." Moisture-density data are important in earthwork, for, as a rule, optimum stability

[3] This section was prepared by the Physical Research Branch, Bureau of Public Roads. Test data in table 5 were obtained in the Soils Laboratory, Bureau of Public Roads. Some of the recommendations regarding the use of soil materials in highway construction are based on information obtained from the Bureau of Soil Mechanics, New York Department of Public Works.

[4] Italic numbers in parentheses refer to Literature Cited, p. 74.

is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

Engineering classification systems

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (*1*). In this system soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, which is made up of clay soils having low strength when wet. Within each group the relative engineering value of the material is indicated by a group index number, ranging from 0 for the best material in the soil group to 20 for the poorest. The group index number is shown in parentheses, following the soil group symbol, in the next to last column in table 5. The principal characteristics according to which soils are classified in this system are shown in table 6.

Some engineers prefer to use the Unified soil classification system (*24*). In this system, soil materials are identified as coarse grained (8 classes), fine grained (6 classes), or highly organic. An approximate classification can be made in the field. For exact classification, mechanical analyses are used for GW, GP, SW, and SP soils, and mechanical analyses, liquid limit, and plasticity index data are used for GM, GC, SM, and SC soils and for the fine-grained soils. A plasticity chart, on which the liquid limit and the plasticity index may be plotted, is required for classification of the fine-grained soils and for identification of the secondary component of the silty and clayey sands and gravels. The principal characteristics of the 15 classes of soil are given in table 7. The classification of the tested soils according to the Unified system is given in the last column of table 5.

Soil Engineering Data and Recommendations

Some of the engineering information can be obtained from the soil map and the soil associations map. It will often be necessary, however, to refer to the text of the report, particularly to the subsection, Physiography and Soil Materials, and to the sections, Descriptions of Soils, and Soil Associations.

The soil test data in table 5, together with information given in the remainder of the report and experience with the same soils in other counties, were used as a basis for preparing the soil engineering data and recommendations given in table 8. Although some of the soil series have not been mapped separately, the engineer can use the tabulated data to determine the approximate engineering characteristics of the undifferentiated soil groups and soil associations shown on the maps.

There is considerable variation in the texture (grain size) of glacial and water-deposited materials. Hence, it should not be anticipated that the engineering soil classifications given in table 8 will apply to all portions of a mapped soil unit. Also, in establishing the engineering classifications, cobbles and stones, that is, particles larger than 3 inches in size, are not considered. Many of the soils, particularly those derived from glacial till, are very stony, and the presence of many large stones is important in earth work because they interfere with preparation of

TABLE 6.—*Classification of soils by Amer*

General classification	Granular materials (35 percent or less passing No. 200				
Group classification	A–1		A–3	A–2	
	A–1–a	A–1–b		A–2–4	A–2–5
Sieve analysis: Percent passing—					
No. 10	50 maximum.				
No. 40	30 maximum.	50 maximum.	51 minimum.		
No. 200	15 maximum.	25 maximum.	10 maximum.	35 maximum.	35 maximum.
Characteristics of fraction passing No. 40:					
Liquid limit			NP [2]	40 maximum.	41 minimum.
Plasticity index	6 maximum.	6 maximum.	NP	10 maximum.	10 maximum.
Group index	0	0	0	0	0
Usual types of significant constituent materials.	Stone fragments, gravel, and sand.	Stone fragments, gravel, and sand.	Fine sand.	Silty gravel and sand.	Silty gravel and sand.
General rating as subgrade	Excellent to good.				

[1] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. I): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, A. A. S. H. O. Desgination: M 145–49.

[2] NP—nonplastic.

[3] Plasticity index of A–7–5 subgroup is equal to, or less than, LL minus 30. Plasticity index of A–7–6 subgroup is greater than, LL minus 30.

the finish, or surface, layer of the earth structure. Areas in which the surface layer of the soil is very stony are shown on the soil maps.

Frost action is one of the primary soil engineering problems in the county. While it might be desirable to suspend earthwork operations during the winter months to prevent the use of frozen soil materials for constructing embankments, it may not be economically feasible to do so. In table 8 the soils are rated according to their adaptability to winter grading.

Susceptibility of the soil material to frost action has also been considered in rating the soils as sources of "sand-gravel" material. In general, for a soil to be nonsusceptible to frost action, less than 10 percent of the soil material should pass the No. 200 sieve. Even if a soil is rated as "good," it may be necessary to explore extensively to find material that meets this criterion.

The ratings given the soils in table 8 as sources of topsoil for slopes of embankments, ditches, and cut slopes, were developed for this county. Normally, only the material from the uppermost layer will be used.

If highways are built on soils that have developed from thick glacial till, bedrock may be reached in very deep cuts. Pockets of wet, fine-grained soil material should be removed and replaced by coarser grained material. Some of the glacial till consists of fine sand and silt, which are susceptible to differential frost heave. Where these materials are encountered, a sufficient thickness of material that is not susceptible to heaving should be used in the highway subgrade to prevent detrimental heaving of the pavement. If there are clay lenses or pockets in the coarse-grained deposits, differential frost heave may be prevented either by mixing the clay with the coarse-grained material so heaving will be uniform, or by using a sufficient thickness of very permeable sandy gravel or coarse sand in the upper portion of the subgrade. In cuts some underdrains will be required in the roadway section. The requirements for underdrains should be determined by field exploration.

The primary engineering problems presented by the Becket, Hermon, and Skerry soils, which have developed from thin glacial tills, result from the fact that bedrock is very near the surface. On these soils the highway grade-line should be kept high so that bedrock excavation will not be necessary, and so as to avoid the seepage conditions that are likely to exist in the contact zone between the till and rock. The precautions described above regarding earthwork, prevention of frost heave, and artificial drainage in thick tills also apply to highway construction in thin tills.

The gravelly beach deposits, if properly compacted, form good subgrades for roads. Underdrains may be needed, however, because of seepage where road cuts are deep enough to reach the underlying glacial till of the Cook, Coveytown, and Fahey soils. The Cook soils, in some areas, have a mucky loam surface layer up to 12 inches thick, that should be removed from the roadway section.

Soils developed from glacial outwash, kames, kame-terraces, and deltas are included under the heading, Glacial outwash, in table 8. A mapping unit may contain two or more types of deposits. The engineering problems, however, may not be the same for all these glacial deposits. Road construction in glacial outwash may require less earthwork than construction in the other deposits. Kames and kame-terraces commonly contain strata or lenses of fine sand or silt, which make it necessary to

ican Association of State Highway Officials [1]

sieve)		Silt-clay materials (More than 35 percent passing No. 200 sieve)				
A–2		A–4	A–5	A–6	A–7	
A–2–6	A–2–7				A–7–5	A–7–6
35 maximum.	35 maximum.	36 minimum.	36 minimum.	36 minimum.	36 minimum.	36 minimum.
40 maximum. 11 minimum.	41 minimum. 11 minimum.	40 maximum. 10 maximum.	41 minimum. 10 maximum.	40 maximum. 11 minimum.	41 minimum. 11 minimum. [3]	41 minimum. 11 minimum.[3]
4 maximum.	4 maximum.	8 maximum.	12 maximum.	16 maximum.	20 maximum.	20 maximum.
Clayey gravel and sand.	Clayey gravel and sand.	Nonplastic to moderately plastic silty soils.	Highly elastic silts.	Medium plastic clays.	Highly plastic clays.	Highly plastic clays.
Fair to poor.						

TABLE 7.—*Characteristics of soil groups*

Major division	Group symbol	Soil description	Value as foundation material [2]	Value as base course directly under bituminous pavement	Value for embankments
Coarse-grained soils (*less than 50 percent passing No. 200 sieve*):					
Gravels and gravelly soils (*more than half of coarse fraction retained on No. 4 sieve*).	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	Excellent	Good	Very stable; use in pervious shells of dikes and dams.
	GP	Poorly graded gravels and gravel-sand mixtures; little or no fines.	Good to excellent.	Poor to fair	Reasonably stable; use in pervious shells of dikes and dams.
	GM	Silty gravels and gravel-sand-silt mixtures.	Good	Poor to good	Reasonably stable; not particularly suited to shells, but may be used for impervious cores or blankets.
	GC	Clayey gravels and gravel-sand-clay mixtures.	Good	Poor	Fairly stable; may be used for impervious core.
Sands and sandy soils (*more than half of coarse fraction passing No. 4 sieve*).	SW	Well-graded sands and gravelly sands; little or no fines.	Good	Poor	Very stable; may be used in pervious sections; slope protection required.
	SP	Poorly graded sands and gravelly sands; little or no fines.	Fair to good	Poor to not suitable.	Reasonably stable; may be used in dike section having flat slopes.
	SM	Silty sands and sand-silt mixtures.	Fair to good	Same	Fairly stable; not particularly suited to shells, but may be used for impervious cores or dikes.
	SC	Clayey sands and sand-clay mixtures.	Fair to good	Not suitable	Fairly stable; use as impervious core for flood-control structures.
Fine-grained soils (*more than 50 percent passing No. 200 sieve*):					
Silts and clays (*liquid limit of 50 or less*).	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, and clayey silts of slight plasticity.	Fair to poor	Not suitable	Poor stability; may be used for embankments if properly controlled.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays.	Fair to poor	Not suitable	Stable; use in impervious cores and blankets.
	OL	Organic silts and organic clays having low plasticity.	Poor	Not suitable	Not suitable for embankments.
Silts and clays (*liquid limit greater than 50*).	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, and elastic silts.	Poor	Not suitable	Poor stability; use in core of hydraulic fill dam; not desirable in rolled fill construction.
	CH	Inorganic clays having high plasticity and fat clays.	Poor to very poor.	Not suitable	Fair stability on flat slopes; use in thin cores, blankets, and dike sections of dams.
	OH	Organic clays having medium to high plasticity and organic silts.	Same	Not suitable	Not suitable for embankments.
Highly organic soils	Pt	Peat and other highly organic soils.	Not suitable	Not suitable	Not used in embankments, da

[1] Based on information in The Unified Soil Classification System, Technical Memorandum No. 3–357, Vols. 1, 2, and 3, Waterways Experiment Station, Corps of Engineers, 1953 (*24*). Ratings and ranges in test values are for guidance only. Design should be based on field survey and test of samples from construction site.

in Unified soil classification system [1]

Compaction: Characteristics and recommended equipment	Approximate range in A. A. S. H. O. maximum dry density [3]	Field (in-place) CBR	Subgrade modulus, k	Drainage characteristics	Comparable groups in A. A. S. H. O. classification
	Lb./cu. ft.		*Lb./sq. in./in.*		
Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	125–135	60–80	300+	Excellent	A–1.
Same	115–125	25–60	300+	Excellent	A–1.
Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	120–135	20–80	200–300+	Fair to practically impervious	A–1 or A–2.
Fair, use pneumatic-tire or sheepsfoot roller.	115–130	20–40	200–300	Poor to practically impervious	A–2.
Good; use crawler-type tractor or pneumatic-tire roller.	110–130	20–40	200–300	Excellent	A–1.
Same	100–120	10–25	200–300	Excellent	A–1 or A–3.
Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	110–125	10–40	200–300	Fair to practically impervious	A–1, A–2, or A–4.
Fair; use pneumatic-tire roller or sheepsfoot roller.	105–125	10–20	200–300	Poor to practically impervious	A–2, A–4, or A–6.
Good to poor; close control of moisture is essential; use pneumatic-tire or sheepsfoot roller.	95–120	5–15	100–200	Fair to poor	A–4, A–5, or A–6.
Fair to good; use pnuematic-tire or sheepsfoot roller.	95–120	5–15	100–200	Practically impervious	A–4, A–6, or A–7.
Fair to poor; use sheepsfoot roller [4]	80–100	4–8	100–200	Poor	A–4, A–5, A–6, or A–7.
Poor to very poor; use sheepsfoot roller [4]	70–95	4–8	100–200	Fair to poor	A–5 or A–7.
Fair to poor; use sheepsfoot roller [4]	75–105	3–5	50–100	Practically impervious	A–7.
Poor to very poor; use sheepsfoot roller [4]	65–100	3–5	50–100	Practically impervious	A–5 or A–7.
ms, or subgrades for pavements				Fair to poor	None.

[2] Ratings are for subgrade and subbases for flexible pavement.

[3] Determined in accordance with test designation T 99–49, A. A. S. H. O.

[4] Pneumatic-tire rollers may be advisable, particularly when moisture content is higher than optimum.

TABLE 8.—*Highway soil engineering*

GLACIAL

Soil series	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading
			A. A. S. H. O.	Unified	
		Percent			
Becket	4 to 15 feet of well-drained stony sandy loam, stony loamy sand, or loamy sand over rock.	8–45	A–2 or A–4	SM	Limited
Brayton	Imperfectly to poorly drained stony fine sandy loam.	1– 8	A–2 or A–4	SM, SC, or ML	Not adapted
Dannemora	Poorly drained stony loam or stony sandy loam.	1– 8	A–2 or A–4	SM or ML	Not adapted
Empeyville	Moderately well drained stony loam or stony sandy loam.	2–15	A–2 or A–4	SM or ML	Limited
Grenville	Well-drained stony loam or stony sandy loam	2–15	A–2 or A–4	SM or ML	Limited
Hermon	4 to 15 feet of well-drained stony loamy sand or stony sandy loam over rock.	8–60	A–1, A–2, or A–4.	GM or SM	Limited
Hogansburg	Moderately well drained stony loam or stony sandy loam.	2– 8	A–2 or A–4	SM or ML	Limited
Massena	Poorly drained stony fine sandy loam or sandy loam.	1– 5	A–2 or A–4	SM, SC, or ML	Not adapted
Moira	Moderately well drained stony loam, stony sandy loam, or sandy loam.	2–15	A–2 or A–4	SM or ML	Limited
Parishville	Well-drained stony loam or stony sandy loam	2– 8	A–2 or A–4	SM or ML	Limited
Ridgebury	Poorly drained stony loam, stony sandy loam, or loamy sand.	1– 5	A–2 or A–4	SM or ML	Not adapted
Skerry	4 to 15 feet of imperfectly to moderately well-drained stony loam, stony sandy loam, or stony loamy sand, over rock.	3–15	A–2 or A–4	SM or ML	Limited
Sun	Very poorly drained stony fine sandy loam or stony loam.	0– 3	A–2 or A–4	SM, SC, or ML	Not adapted
Tughill	Very poorly drained stony loam or stony sandy loam.	0– 3	A–2 or A–4	SM or ML	Not adapted
Westbury	Imperfectly to poorly drained stony loam or stony sandy loam.	1– 8	A–2 or A–4	SM or ML	Not adapted
Whitman	Very poorly drained stony loam or stony sandy loam.	0– 3	A–2 or A–4	SM or ML	Not adapted
Worth	Well-drained stony sandy loam or stony loamy sand.	2–25	A–1, A–2, or A–4.	GM or SM	Limited
					BEACH DEPOSITS AND
Cook	3 to 4 feet of very poorly drained stony or gravelly loamy sand or sandy loam over till.	0– 3	A–1, A–2, or A–4.	GM, SM, or SP	Not adapted
Coveytown	3 to 4 feet of poorly drained stony loamy sand, gravelly loamy sand, or stony sandy loam, over till.	1– 5	A–1, A–2, or A–4.	GM, SM, or SP	Not adapted
Fahey	3 to 5 feet of moderately well drained loamy sand or gravelly sand over till.	2– 8	A–1 or A–2 over A–2 or A–4.	GM, SM, SP, or SW over SM or ML.	Fair
Trout River	Well-drained gravelly loamy sand or gravelly sand.	2– 8	A–1 or A–2	GM, SM, SP, or SW.	Fair

See footnotes at end of table.

data and recommendations

TILL

Depth to seasonally high water table	Recommended location of gradeline with respect to ground surface	Suitability as source of—		Remarks
		Topsoil	Sand-gravel [1]	
Feet Deep [2]	Influenced by bedrock	Poor	Not suitable	Underdrains required in cuts that approach bedrock; suitability as a source of topsoil material depends on stoniness.
1½ to 4	Anywhere	Fair	Not suitable	Suitability as a source of topsoil depends on stoniness.
1 to 4	Anywhere	Poor	Not suitable	Same.
2½ to 6	Anywhere	Poor	Not suitable	Same.
Deep	Anywhere	Fair	Not suitable	Same.
Deep	Influenced by bedrock	Poor	Limited	Underdrains required in cuts that approach bedrock; suitability as a source of topsoil depends on stoniness; suitability as a source of sand and gravel depends on depth and stoniness.
3 to 5	Anywhere	Fair	Not suitable	Suitability as a source of topsoil depends on stoniness.
1 to 4	Anywhere	Fair	Not suitable	Same.
2½ to 6	Anywhere	Poor	Not suitable	Same.
Deep	Anywhere	Poor	Not suitable	Same.
1 to 4	Anywhere	Poor	Not suitable	Same.
2½ to 6	Influenced by bedrock	Poor	Not suitable	Underdrains required in cuts that approach bedrock; suitability as a source of topsoil depends on stoniness.
Shallow [3]	4 feet above invert of ditch.	Poor	Not suitable	Suitability as a source of topsoil depends on stoniness.
Shallow	Same	Poor	Not suitable	Same.
1½ to 4	Same	Poor	Not suitable	Same.
Shallow	Same	Poor	Not suitable	Same.
Deep	Anywhere	Poor	Limited	Suitability as a source of topsoil and as a source of sand and gravel depends on stoniness.

WAVE-WORKED TILL

Shallow	4 feet minimum above water table.	Poor	Not suitable	
1 to 3	Same	Poor	Limited	Suitability as a source of sand and gravel influenced by water table.
3 to 10	4 feet above invert of ditch.	Not suitable	Limited	
Deep	Anywhere	Not suitable	Good	

TABLE 8.—*Highway soil engineering*

Soil series	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading
			A. A. S. H. O.	Unified	
		Percent			
GLACIAL					
Adams	Well-drained deep sand	1–15	A–3	SP	Fair
Au Gres	Imperfectly to poorly drained deep sand	1–15	A–3	SP	Not adapted
Colton	2 to 4 feet of well-drained gravelly sand over stratified sand and gravel.	1–25	A–1 or A–2	GP, GW, SP, or SW.	Good
Constable	Same	1–25	A–1 or A–2	GP, GW, SP, or SW.	Good
Croghan	Moderately well-drained deep sand	1– 8	A–3	SP	Limited
Duane	2 to 4 feet of moderately well drained gravelly sand over stratified sand and gravel.	1– 8	A–1 or A–2	GM, or SM over GW or SW.	Limited
Kars	2 to 4 feet of well-drained gravelly loam or gravelly sandy loam over stratified sand and gravel.	1– 8	A–2 or A–4 over A–1, A–2, or A–3.	SM over GP, GW, SP, or SW.	Good
Scarboro	8 inches of very poorly drained mucky sandy loam over sand or loamy sand.	0– 3	A–4 over A–2, or A–3.	OL over SP or SM.	Not adapted
Wallace	Well-drained deep sand	1–15	A–3	SP	Fair
Walpole	Poorly drained sand or gravelly sand	1– 5	A–1, A–2, or A–3.	SP or SW	Not adapted
GLACIOLACUSTRINE					
Birdsall	Very poorly drained fine sandy loam, silt loam, sand, or silt.	0– 2	A–3, A–4, or A–6.	SM, SP, ML, or CL.	Not adapted
Madalin	Poorly drained silt loam or silty clay loam	0– 2	A–4 or A–6	ML or CL	Not adapted
Nicholville	Moderately well drained fine sandy loam,[4] silt, or sand.	1– 8	A–3 or A–4	SP, SM, or ML	Not adapted
Rhinebeck	Imperfectly drained silt or clay	1– 6	A–4 or A–6	ML or CL	Not adapted
Salmon	2 to 3 feet of well-drained fine sandy loam over stratified fine sand and silt.[5]	1–25	A–4 over A–3 or A–4.	ML over SP, SM, or ML.	Limited
Wallington	3 feet of poorly drained fine sandy loam to silt loam over stratified (varved) sand and silt.	0– 2	A–4 over A–3 or A–4.	ML over SP, SM, or ML.	Not adapted
MARINE					
Covington	Poorly drained silty clay or clay	0– 2	A–6 or A–7	CL, MH, or CH	Not adapted
Livingston	6 to 12 inches of very poorly drained muck or silty muck, over silty clay.	0– 2	A–6 or A–7	Pt or OL over CL, CH, or MH.	Not adapted
Panton	Poorly drained silty clay or clay	2– 5	A–6 or A–7	CL or CH	Not adapted
Swanton	1½ to 3 feet of poorly drained fine sandy loam over clay.	1– 3	A–2 or A–4 over A–7.	SM, SC, or ML over CH.	Not adapted

See footnotes at end of table.

data and recommendations—Continued

Depth to seasonally high water table	Recommended location of gradeline with respect to ground surface	Suitability as source of—		Remarks
		Topsoil	Sand-gravel [1]	
OUTWASH				
Feet				
Deep	Anywhere	Poor	Not suitable	
1½ to 4	4 feet above invert of ditch.	Poor	Not suitable	
Deep	Anywhere	Not suitable	Good	
Deep	Anywhere	Not suitable	Good	
3 to 5	4 feet above invert of ditch.	Not suitable	Not suitable	
3 to 5	4 feet above invert of ditch.	Not suitable	Limited	Suitability as a source of sand and gravel influenced by water table.
Deep	Anywhere	Fair to good	Fair	
1 to 3	4 feet above invert of ditch.	Poor	Not suitable	Remove organic soil material before construction of embankment.
Deep	Anywhere	Poor	Not suitable	
2 to 4	4 feet above invert of ditch.	Poor	Limited	Suitability as a source of sand and gravel influenced by water table.
DEPOSITS				
Shallow	4 feet minimum above water table.	Fair	Not suitable	
Shallow	Same	Fair	Not suitable	
3 to 6	Same	Fair to good	Not suitable	
1½ to 3	Same	Fair	Not suitable	
Deep	Anywhere	Fair to good	Not suitable [3]	
1 to 3	4 feet minimum above water table.	Fair	Not suitable	
CLAYS				
1 to 3	4 feet minimum above water table.	Poor	Not suitable	
Shallow	Same	Not suitable	Not suitable	Remove organic soil material before construction of embankment.
1½ to 3	Same	Poor	Not suitable	
1 to 3	Same	Poor	Not suitable	

TABLE 8.—*Highway soil engineering*

ALLUVIAL

Soil series	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading
			A. A. S. H. O.	Unified	
		Percent			
Eel	2 to 3 feet of moderately well drained loam or sandy loam over stratified sandy and gravelly material.	0– 2	A–2 or A–4	ML, SM, or SC	Not adapted
Genesee	2 to 3 feet of well-drained sandy loam, over stratified sandy and gravelly material.	0– 2	A–2 or A–4	ML, CL, SM, or SC.	Not adapted
Ondawa	Same	0– 2	A–2 or A–4	SM or SC	Not adapted
Podunk	2 to 3 feet of moderately well drained loam or sandy loam, over stratified sandy and gravelly material.	0– 2	A–2 or A–4	ML, SM, or SC	Not adapted
Rumney	1½ to 2 feet of poorly drained loam or sandy loam over stratified sandy and gravelly material.	0– 2	A–2 or A–4	ML, SM, or SC	Not adapted
Saco	1½ to 2 feet of very poorly drained loam or sandy loam over stratified sandy and gravelly material.	0– 2	A–2 or A–4	ML, SM, or SC	Not adapted
Sloan	Same	0– 2	A–2 or A–4	ML, SM, or SC	Not adapted
Wayland	1½ to 2 feet of poorly drained loam or sandy loam over stratified sandy and gravelly material.	0– 2	A–2 or A–4	ML, SM, or SC	Not adapted

[1] Material for use as: Selected borrow; aggregate for concrete; foundation course for pavement; and base course for flexible pavement. Field exploration required to determine suitable source.

[2] Water table normally not reached in engineering work; depth, 6 feet or more.

install thick foundation courses to minimize detrimental frost heave. Seepage is a common problem in kame-terraces, either within the body of the deposit or at the line of contact between the deposit and the underlying material of the valley wall.

The Adams and Wallace soils are susceptible to wind erosion where the vegetation is removed.

The glaciolacustrine soils do not make good road foundations because the soil material is fine textured and the water table is near the surface. The fine sand and silt may become "quick" during the passage of construction equipment over the saturated material. Then it becomes necessary to put in a layer of coarse sand or gravelly material to permit the passage of construction equipment. If the wet material is placed in subgrades or embankments, the moisture content must be reduced so that it is not more than slightly above the optimum moisture content; otherwise adequate compaction cannot be obtained. The high-water table and fine sand and silt materials encourage development of ice lenses, which cause differential frost heave. In these soils the gradeline should be above the water table, and a foundation course of very permeable material, thick enough to prevent detrimental frost heave, should be used.

On marine clays it might be desirable, because of the high water table, to build roads on embankments; but that may not be practical, because good embankment material may not be readily available. Very wet material will be found at almost any time of the year if excavations are made in the marine clays. Frost heave of marine clays should be anticipated, but it will usually be relatively uniform.

The "high bottom" alluvial soils are rarely flooded, but the highway gradeline should be at least 2 to 4 feet above the seasonally high water table.

Muck is not suitable for use in foundations of roads or other engineering structures because of the low strength of the material and the normally high-water table. Roads should normally be alined to avoid deep muck. Muck within the roadway cut section should be wasted, or removed, and that in embankment sites or below the gradeline in cut sections should be removed and replaced by a suitable soil material. Small muck areas are not shown on the soil map, and in some depressed areas the muck may underlie several feet of glacial or alluvial material. Consequently, a thorough field investigation should be made in depressed areas.

At many construction sites, major soil variations may occur within the depth of proposed excavation and several soil units may be encountered within a short distance. The soil maps and profile descriptions, as well as the engineering data and recommendations given in this section, should be used in planning detailed surveys of soils at construction sites. Using the information in the soil survey reports will enable the soils engineer to concentrate on the most suitable soil units. Then a minimum number

data and recommendations—Continued

DEPOSITS

Depth to seasonally high water table	Recommended location of gradeline with respect to ground surface	Suitability as source of—		Remarks
		Topsoil	Sand-gravel [1]	
Feet				
2 to 4	Above high water	Good	Not suitable	Material in underlying strata may classify as A–2, A–3, or A–4, with silt-clay lenses. Material in underlying strata may classify as GP, GM, SP, SM, or ML, with silt-clay lenses.
3 to 6	Above high water	Good	Not suitable	Same.
3 to 6	Above high water	Good	Not suitable	Same.
2 to 4	Above high water	Good	Not suitable	Same.
1 to 3	Above high water	Fair	Not suitable	Same.
Shallow	Above high water	Poor	Not suitable	Same.
Shallow	Above high water	Poor	Not suitable	Same.
1 to 3	Some high water	Fair	Not suitable	Same.

[3] Water table in upper foot of soil in spring; water may stand on surface several days in any part of the year.

[4] Material that overlies till is stony sandy loam.

[5] Underlain in places by strata of sand or gravel at depths of 10 feet or more. Underlying strata may be source of sand and gravel.

of soil samples will be required for laboratory testing, and an adequate soil investigation can be made at minimum cost.

Some Geographic Factors Related to Soils

Various factors have affected the soils of Franklin County. The location of the county and the climate, relief, and native vegetation have all affected development of the soils. These factors and others related to the development and present economy of the county are discussed in the following subsections.

Location

Franklin County is in the northeastern part of New York State (fig. 1). It is bordered on the east by Clinton County, on the west by St. Lawrence County, on the south by Essex and Hamilton Counties, and on the north by Quebec Province, Canada. Malone, the county seat, is about 70 miles southwest of Montreal, Canada; 155 miles north of Albany; and 195 miles northeast of Syracuse. The county is nearly rectangular. The width along the northern and southern borders is about 31 miles, and the length is about 62 miles along the eastern and western borders. The county has a total area of 1,078,400 acres, or 1,685 square miles.

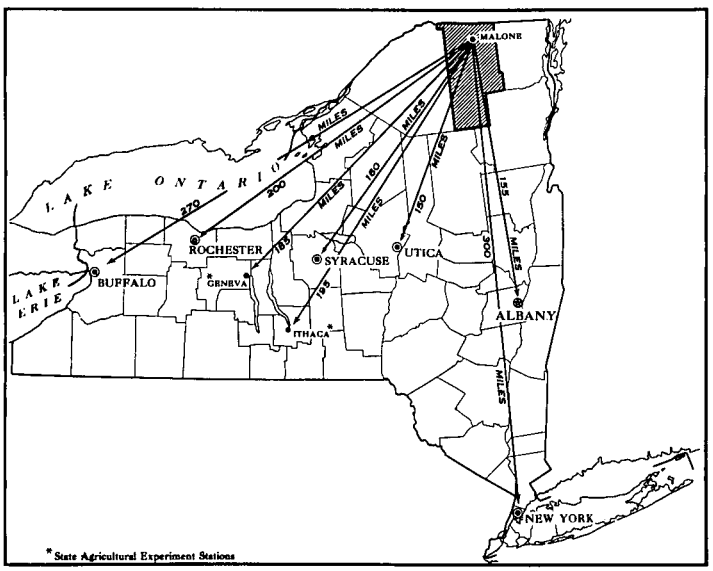

Figure 1.—**Location of Franklin County in New York.**

History of Development

The first organized settlement in the area that is now Franklin County was made in 1750 by Indians of the Caughnauga tribe. This settlement was along the St. Regis River in the area now included in the St. Regis Indian Reservation. The first permanent white settlement was made by Benjamin Roberts at Chateaugay in 1796. Other pioneers who followed during the next few years settled Burke and adjoining areas. The county was created by an act of the State Assembly in March 1808.

The remoteness of the area from markets slowed development and left the early settlers on their own initiative. In the first half of the nineteenth century, communication with the outside world was mainly by stagecoach over very poor roads. Boats on the St. Lawrence River, however, were used to some extent. Farming was the chief occupation of the early settlers, and the products were generally used on the farm. Shallow iron mines were developed in several places, and forges for manufacture of simple tools operated in Malone as early as 1815. The earliest export from the county was crude potash produced from wood ashes. Potato starch and hops were agricultural products produced for export in the early years.

The Rutland Railroad, running from east to west through the county, was completed in 1850. This improvement in transportation stimulated dairying, and creameries and cheese factories sprang up along the railroad. In 1890 the construction of a railroad from Montreal through Malone to Utica was begun. When completed this new railroad stimulated exploitation of the vast timber resources in the mountainous part of the county. The development of that area for summer and health resorts was also accelerated by the railroad and later by highways. Because forests in the county were being depleted rapidly, the Adirondack State Park was developed.

At present agriculture is the principal source of livelihood in the northern part of the country, but a few small industries are located in Malone. In the mountainous section, summer and health resorts are numerous, and a few people are engaged in lumbering and related occupations.

Population

The population of the county was 44,830 in 1950. Approximately 45 percent was classed as urban. The average population of 26.6 persons per square mile is by no means uniformly distributed. In the valley of the St. Lawrence River, the people are fairly evenly distributed except in the broad belt of sandy soils. In the mountains they are concentrated in the villages and resort centers, and vast wilderness areas are uninhabited.

Malone, the county seat and a railroad and trading center, is the largest village in the county. It had a population of 9,501 in 1950. Tupper Lake, population 5,441, and Saranac Lake, population 6,913, are health and summer-resort towns in the mountain area. Other incorporated villages and their populations are Brushton 516, Burke 316, Chateaugay 1,234, and Fort Covington 891. Unincorporated hamlets that serve as local trading centers in the northern part of the county are Brainardsville, Constable, Whippleville, North Bangor, St. Regis Falls, Dickinson Center, Moira, Bombay, and Hogansburg.

Agriculture

Agriculture has always been the principal industry of Franklin County. About 24.3 percent of the total land area, or about 305,427 acres, was in farms in 1950 according to the Federal census. Farms averaged about 147.3 acres in size. Total cropland in 1950 was 130,496 acres. Of the land in farms, about 93 percent was owned by the farm operator.

The main crops grown are those used in a typical dairy-farm rotation. Hay has long been the most important crop in the county, and oats and corn for silage are next in importance. Potatoes are the main cash crop, but their present acreage is only about half that of 30 years ago. Barley, wheat, and buckwheat were once sown on fairly large acreages, but they are no longer important. Hops were once an important crop, but only a few hopyards are now producing. The principal crops of Franklin County in 1949, and the value of some of the products sold, are listed as follows:

	Acres
Corn for all purposes	7, 500
Oats	11, 283
Threshed or combined	7, 524
Cut for feeding unthreshed	3, 759
All hay	84, 076
Alfalfa cut for hay	1, 523
Clover or timothy cut for hay	63, 706
Small grain cut for hay	4, 502
Silage made from grass or hay	128
Other hay cut	14, 217
Irish potatoes harvested	[1] 2, 078
Vegetables harvested for sale	385
	Dollars
All crops sold	984, 851
All forest products sold	133, 914
Maple sirup and sugar sold	52, 565

[1] Does not include acres for farms with less than 15 bushels harvested.

Up to about 1860, most of the farm products were used on the farm. As railroads were completed and transportation was improved, dairying became important. Until about 1900 the dairy industry centered around local processing of butter and cheese. Since that date production of fluid milk for the large city markets has increased in importance, and fluid milk is now the principal product sold.

Compared to dairy cows, other livestock are of minor importance. According to the census, the number and value of livestock raised in Franklin County during 1950, and the value of livestock products sold, were as follows:

	Number	*Value*
Cattle and calves	40, 857	$5, 884, 980
Milk cows	25, 229	[1]
Dairy products sold	[1]	6, 202, 552
Whole milk sold—pounds	153, 976, 146	6, 183, 538
Horses and mules	3, 096	241, 345
Hogs and pigs	1, 809	41, 277
Sheep and lambs	487	7, 335
Poultry and poultry products sold	[2] 59, 029	305, 688

[1] Figure not available.

[2] Includes chickens, turkeys, and ducks.

Physiography and Soil Materials

Franklin County is in two major physiographic provinces. The northern one-third, which is in the principal farming area, is in the St. Lawrence Valley plain. The southern two-thirds is in the Adirondack Mountains (*7*). The cleared fields and many prosperous dairy farms of the St. Lawrence lowland contrast sharply with the forested and sparsely settled areas within the Adirondack Mountains. This contrast in culture is almost as marked as that of the bedrock geology and nearly coincides with it.

The St. Lawrence Valley plain is a smooth glacial plain. Its northern part has been smoothed even more by a mantle of marine clay. The entire glacial mantle rests on a late Tertiary peneplain that bevels with the underlying rock at a slight angle.

That part of the plain in which Franklin County is located has a maximum elevation of about 1,300 feet. This elevation occurs at the point where the plain merges with the mountains to the south. The slope of the plain is long and gentle and extends north and west to the St. Lawrence River, where the elevation, at the lowest point, is about 160 feet.

The elevations for the glacial plain are generally much less than 100 feet. Within the plain local relief, from knolls to adjacent depressions, are almost entirely within the mantle of glacial drift and do not reflect an uneven bedrock surface. A notable exception, however, occurs where the Chateaugay River has cut a gorge, 100 or more feet deep, through the rocks between Chateaugay Lake and Brayton Hollow, about 4 miles south of the Canadian border. Some of the other large streams flow through rock-floored valleys, but the valley walls consist of glacial drift.

The northern and western part of the Adirondack section consists of mountains that rise to elevations of 2,000 to 3,500 feet. Numerous broad valleys filled with glacial drift occur at elevations of 1,500 to 1,600 feet. Mountains in this area are generally rounded. Lakes are common in the broad drift-filled valleys. In the southern part of the county, the mountains are higher and more rugged, and here Seward Mountain reaches an elevation of 4,404 feet.

Rock formations.—Franklin County is underlain by many kinds of rock. The general distribution of the principal rocks is shown in figure 2. The oldest rocks are the metamorphosed gneisses of the Grenville formation, which occur in small patches within the Adirondacks (not shown in fig. 2). Next younger are the anorthosites, from which the more rugged mountains in the southern part of the county were formed. Still younger rocks in the mountains are syenites, granites, and gabbros, which were intruded into the older rocks (*3*). These are shown in figure 2 as the granite-syenite complex. The St. Lawrence valley plain is underlain by sedimentary rocks that are relatively much younger. The northern part is underlain by Ordovician limestone, and the rest of the county, by Cambrian sandstone.

Beekmantown limestone is the youngest consolidated rock in Franklin County. It occupies a narrow wedge-shaped band along the northern edge of the county. This formation, which dips very gently to the north, consists of thick magnesian limestone interbedded with thin layers of calcareous sandstone. The rock is exposed in a few places in the channels of the larger streams and on a few low ridge slopes. For the most part, however, it is deeply buried under glacial drift.

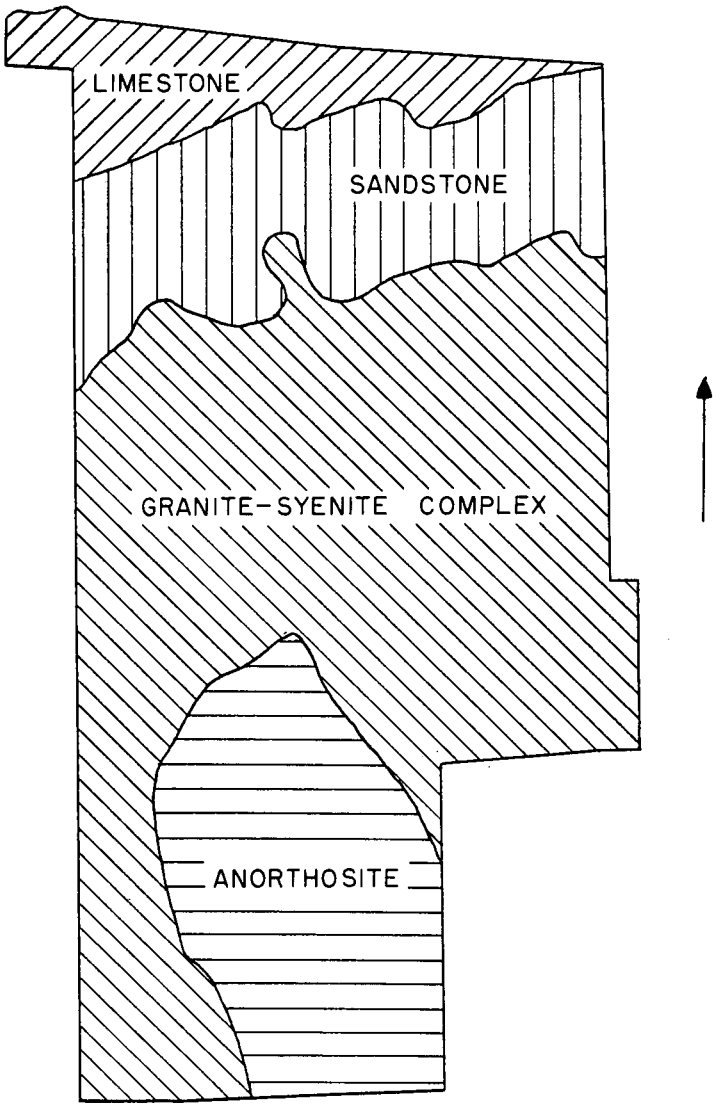

***Figure 2.*—Generalized map of the rock formations of Franklin County.**

Potsdam sandstone occupies a belt 8 to 12 miles wide between the Adirondacks and the limestone belt already described. It consists of light-gray to almost white, hard, siliceous sandstone, which in some places closely resembles quartzite. The upper part of the formation contains thin calcareous layers, but the lower part is massive conglomerate. This formation dips gently to the north. The rock is exposed in the deep gorge of the Chateaugay River in the eastern part of the county and in several places along the Salmon and Trout Rivers. A few small exposures occur in the uplands. A short distance southeast of Malone, this rock is quarried for use as building stone.

The granite-syenite complex is composed of a number of crystalline rocks that range from granites and syenites through diabase and gabbro. In this area the predominant rocks are granitic or syenitic, and they have a gneissic

structure. Extensive exposures are common throughout the northern and western part of the Adirondacks.

The anorthosites are believed to be the oldest intrusive rocks in the Adirondack area (*7*). They are coarse-grained rocks that consist almost entirely of labradorite. These rocks form the hard core of the higher Adirondack Mountains. They occur in the southern and southeastern parts of Franklin County.

The oldest rocks of Franklin County are those in the Grenville formation (*7*). Small areas of this formation occur throughout the Adirondack section. The rocks are marble, schist, and gneiss. Because of their small area, they are relatively unimportant to soil formation in Franklin County.

More information about the geology of the Adirondacks section can be obtained by reading publications by Buddington (*3*), Martin (*11*), Reed (*16*), and Miller (*13*) listed in Literature Cited.

Glaciation.—The entire county was covered by ice during the Wisconsin stage of the Pleistocene epoch, and most of it is covered by a mantle of glacial drift. This glacial drift is the parent material from which the soils have formed. In most places the drift strongly reflects the character of the underlying rock. Hence the underlying rock strongly influences the soils in the county, even though no soils have formed on residuum weathered directly from bedrock.

Detailed studies of the glacial features of Franklin County have not been published. Some general information is available, however, from the work of Fairchild (*6*) and Buddington (*3*). In addition, information about the distribution of different kinds of glacial drift can be derived from studying the soil maps in the back of this report. Because weathering and soil formation have been active for only a comparatively short time in this area, the characteristics of the parent materials of the soils are strongly reflected in the soil profiles. The relationship of soil series to kind of glacial drift is indicated in table 10 in the section, Soil Formation and Classification. The material (C or D horizon) immediately beneath the solum is described for each soil in the section, Descriptions of Soils.

The characteristics and distribution of exposed glacial drift result from the last advance of the glacial ice. In some places the glacial drift was modified after the ice retreated. As the ice retreated, the highest uplands were bared first, because the ice was thinnest there. As the glacier continued to melt, the higher lying valleys were uncovered. Because of the ice barrier to the north, however, the valleys were dammed and became filled by proglacial lakes. As a result nearly all of the valleys in the mountains now contain deposits of water-sorted and water-laid sand and gravel. Continued retreat of the glacier finally exposed the St. Lawrence Valley plain on the north. The ice barrier continued to check drainage, however, and a proglacial lake persisted along the southern border of the ice. Fairchild (*6*) attributes the distinct beach lines and deltas at an elevation of about 1,000 feet to the presence of this lake, which at this stage had its outlet around Covey Hill to the northeast in Clinton County.

When the ice retreated further to the north, the area now in Franklin County below the present 700-foot elevation was covered by the Champlain Sea. A succession of beach ridges, extending from the 700-foot contour to the international boundary, marks successive sea levels caused by a slow rise of the land itself after the ice had melted. One persistent line of beaches and deltas along the 500-foot contour evidences a fairly long period of stability.

In Franklin County glacial till covers a large part of the St. Lawrence plain. Most of the till is medium textured, the matrix consisting of sand combined with some silt and clay. The lime content of the till decreases from north to south. In the northwestern part of the county, the till is calcareous at a depth of 1 or 2 feet, and along the southern edge of the area underlain by Potsdam sandstone, it is acid to depths that generally exceed 5 feet. Below an elevation of 1,000 feet the till occupies smooth plains dissected only by the major streams.

Above 1,000 feet, especially in the eastern part of the county between the Chateaugay and Trout Rivers, the till plain is dissected by many level-floored, steep-sided drainage channels that were apparently cut by proglacial streams. Small areas of water-deposited sand and gravel are associated with these channels.

Most of the till below the 500-foot contour shows evidence of water working, probably by the waves of shallow seas. The material contains large erratic boulders and stones typical of till, but the matrix, to a depth of about 3 feet, has mainly the coarser grades of sand combined with only a little clay or silt. This layer grades to typical compact, gray, limy till at depths of 3 or 4 feet. Small areas of similar wave-modified till also occur as high as 1,000 feet above sea level, well above the major area associated with the beach line at 500 feet. All of these areas are characterized by nearly level, long, smooth slopes.

In rather large areas between the old beaches at the 500- and 700-foot elevations, another deviation from the typical ground moraine occurs. These areas consist of fine-textured gray material that contains angular to somewhat rounded, striated stones and boulders typical of other till deposits. The areas are on long, smooth, nearly level slopes. The material may be a thin layer of marine or lacustrine clay deposited over ground moraine. More likely, however, it is till that was largely derived from marine or lacustrine clays that were picked up and reworked by the last advance of the ice.

With 1 or 2 notable exceptions, end moraines of sufficient size to form definite topographic features are lacking in the northern part of Franklin County. This may indicate that the ice retreated steadily across the area and that no prolonged halt occurred. The waters of glacial Lake Iroquois and the Champlain Sea, which covered all of the area below 1,000 feet, may have destroyed small morainic ridges or altered them to the extent that they cannot be recognized easily. One large moraine occurs in the valley of the Salmon River north of Owls Head. The southern edge of this area lies at an altitude of about 1,520 feet, and the land slopes strongly to the north. A small mass of morainic material occurs on the western side of Chateaugay Lake at an elevation of about 1,600 feet, and another small area, at the same elevation, occurs about 1 mile east of Brainardsville and about 2 miles north of Chateaugay Lake.

The stratified glacial drift [5] in Franklin County occurs as outwash sediments, deltas, kames, eskers, beaches, and bottom deposits. Kames, eskers, and outwash sediments

[5] The terms for stratified drift are those used by Flint (*8*), p. 74.

are most common in the drift-filled valleys of the Adirondacks. Deltas, beach deposits, and bottom deposits are most common on the smooth plain of the St. Lawrence Valley section. Specific locations for a number of these stratified drift deposits are given by Buddington (*3*) and Fairchild (*6*). Although the areas of stratified drift are shown in considerable detail on the soil map, the map will not differentiate some of the kinds of stratified drift listed above. The mapping unit, Colton and Constable gravelly loamy sands, 3 to 8 percent slopes, for example, occurs on outwash plains, kames, eskers, and beaches. On the other hand, Kars cobbly and stony loams, 0 to 8 percent slopes occur only on marine beaches where the soil material was derived mainly from limestone.

The extensive sand plains in the northern part of the county were probably formed from material carried by northward flowing streams and deposited in the shallow water of the Champlain Sea. The fine sediments carried into the sea remained in suspension until they reached deeper water, where the currents were weaker and the salt content was higher. Here they were deposited to form the extensive clay flats that occur in the northwestern part of the county.

Climate

Franklin County has a cool, humid continental climate. Summers are relatively cool and short; winters are cold and long. Detailed data on temperatures and precipitation are given in table 9. These figures are from records of the United States Weather Bureau stations at Moira, Tupper Lake, and Gabriels.

Annual precipitation in the county is about 37 inches, nearly half of which falls during the 5 months, May through September. April, which has an average of slightly less than 2½ inches, is usually the driest month. During the summer heavy downpours and thunderstorms occur, but slow gentle rains, which last all day, are more common. During winter most of the precipitation falls as snow. More than 100 inches falls in the northern part of the county, on the average, and 85 to 90 inches falls in the mountainous section. Over most of the county, at least 10 days of precipitation is reported each month. Although total precipitation is greater during the summer months, there is precipitation on a greater number of days in winter than in summer.

The average annual temperature is about 41° F., and the average temperature during the growing season is about 60° F. July, which has an average temperature of about 65° F., is the warmest month, and February, which has an average temperature of about 15°, is the coldest. Extremes of temperature over the county range from a maximum of 101° F. to a minimum of minus 46°. Extremely high summer temperatures are comparatively rare, but subzero temperatures are common in winter.

In the mountains the average growing season ranges from about 97 days to 115 days. The maximum length of the growing season in the northern part of the county is about 135 days. At Moira the average frost-free period extends from mid-May to late September, but frost has been reported as late as June 20 and as early as September 10. At Gabriels the average frost-free period extends from early June until early September, but frost has been reported at this station in all months except July.

414700—58——5

Data on relative humidity are not available for Franklin County, but Canton, in adjacent St. Lawrence County, has an average 8 a. m. relative humidity of 81 percent. At this station humidity ranges from a low of 72 percent

TABLE 9.—*Normal monthly, seasonal, and annual temperature and precipitation at selected stations*

MOIRA (Elevation 200 feet)

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year	Average snowfall
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December	20. 7	66	−27	2. 76	0. 87	4. 19	19. 4
January	15. 4	71	−36	3. 11	1. 38	3. 10	24. 3
February	15. 2	63	−30	2. 96	2. 41	2. 30	24. 3
Winter	17. 1	71	−36	8. 83	4. 66	9. 59	68. 0
March	28. 3	79	−18	3. 03	3. 10	4. 85	18. 3
April	42. 1	87	−1	2. 37	1. 23	4. 16	7. 9
May	54. 3	94	19	3. 08	2. 03	4. 00	. 5
Spring	41. 6	94	−18	8. 48	6. 36	13. 01	26. 7
June	63. 4	94	28	3. 72	3. 16	4. 63	0
July	68. 5	99	39	3. 55	1. 45	3. 13	0
August	66. 2	99	34	3. 31	3. 49	6. 40	0
Summer	66. 0	99	28	10. 58	8. 10	14. 16	0
September	59. 2	92	25	3. 10	3. 08	5. 32	[3]
October	47. 7	83	13	3. 16	4. 32	2. 91	1. 0
November	34. 5	75	−16	2. 87	2. 00	4. 36	10. 6
Fall	47. 1	92	−16	9. 13	9. 40	12. 59	11. 6
Year	43. 0	99	−36	37. 02	[4] 28. 52	[5] 49. 35	106. 3

TUPPER LAKE (Elevation 1,700 feet)

	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December	19. 5	61	−38	2. 41	1. 92	4. 01	16. 4
January	16. 1	63	−38	2. 55	1. 37	2. 67	19. 8
February	15. 4	67	−38	2. 24	1. 27	4. 61	19. 0
Winter	17. 0	67	−38	7. 20	4. 56	11. 29	55. 2
March	26. 4	83	−28	2. 79	1. 87	3. 47	15. 2
April	38. 5	86	−8	2. 30	. 62	5. 95	6. 3
May	51. 9	92	18	3. 25	1. 99	3. 83	. 3
Spring	38. 9	92	−28	8. 34	4. 48	13. 25	21. 8
June	60. 4	96	26	3. 70	1. 38	5. 66	[3]
July	65. 0	98	32	4. 29	4. 37	3. 25	0
August	62. 4	96	31	3. 67	3. 84	4. 65	[3]
Summer	62. 6	98	26	11. 66	9. 59	13. 56	[3]
September	55. 6	94	21	3. 59	1. 62	4. 71	[3]
October	42. 5	85	10	3. 45	3. 89	4. 12	1. 6
November	32. 4	78	−10	2. 79	1. 67	3. 82	9. 7
Fall	43. 5	94	−10	9. 83	7. 18	12. 65	11. 3
Year	40. 5	98	−38	37. 03	[6] 25. 81	[7] 50. 75	88. 3

See footnotes at end of table.

TABLE 9.—*Normal monthly, seasonal, and annual temperature and precipitation at selected stations*—Continued

GABRIELS (Elevation 1,740 feet)

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year	Average snowfall
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	18. 1	60	−46	2. 33	1. 93	1. 63	24. 1
January	15. 6	62	−46	2. 67	. 70	4. 54	26. 0
February	14. 5	65	−42	2. 52	1. 55	2. 90	25. 1
Winter	16. 0	65	−46	7. 52	4. 18	9. 07	75. 2
March	26. 9	76	−32	2. 84	2. 00	5. 15	20. 0
April	38. 9	85	−8	2. 42	. 80	3. 98	9. 5
May	51. 2	94	10	3. 18	. 89	6. 87	. 8
Spring	39. 0	94	−32	8. 44	3. 69	16. 00	30. 3
June	60. 4	101	22	3. 66	3. 72	. 57	[3]
July	65. 1	99	29	3. 78	3. 62	3. 59	[3]
August	62. 9	97	25	3. 57	1. 65	3. 69	0
Summer	62. 8	101	22	11. 01	8. 99	7. 85	[3]
September	56. 5	92	15	3. 73	2. 69	9. 20	. 1
October	45. 5	86	2	3. 27	1. 72	4. 53	2. 2
November	32. 2	75	−14	2. 89	2. 31	3. 39	15. 5
Fall	44. 7	92	−14	9. 89	6. 72	17. 12	17. 8
Year	40. 6	101	−46	36. 86	[8] 23. 58	[9] 50. 04	123. 3

[1] *Moira:* Average temperature based on a 29-year record, through 1930; highest and lowest temperatures on a 30-year record, through 1930. *Tupper Lake:* Average temperature based on a 43-year record, through 1954; highest and lowest temperatures on a 35-year record, through 1952. *Gabriels:* Average, highest and lowest temperatures based on a 35-year record, through 1952.

[2] *Moira:* Average precipitation and wettest and driest years based on a 28-year record, in the period 1900–1930; snowfall based on a 29-year record, through 1930. *Tupper Lake:* Average precipitation based on a 45-year record, in the period 1900–1955; wettest and driest years based on a 40-year record, in the period 1900–1955; snowfall based on a 32-year record, through 1952. *Gabriels:* Average precipitation based on a 27-year record, in the period 1901–1932; wettest and driest years based on a 29-year record, in the period 1901–1945; snowfall, based on a 35-year record, through 1952.

[3] Trace. [4] In 1921. [5] In 1901. [6] In 1941.
[7] In 1954. [8] In 1906. [9] In 1945.

in May to a high of 87 percent in winter (*14*). Noon values are about 25 percent less than those for 8 a. m.

Annually the sun shines only 47 percent of the amount possible, but during the growing season it shines 58 percent of the possible time.

In the northern part of the county, prevailing winds are from the west. Winds commonly range from gentle to stiff breezes, although strong gales are occasionally experienced. Tornadoes are extremely rare.

Vegetation

Franklin County was entirely covered by dense forests when the white man first settled. About three-fourths of the county is still under forest. Most of this is in the mountainous southern part of the county, but nearly a fourth of the 305,427 acres in farms is in woodland, and there are a few large forested areas in the St. Lawrence Plains area. In their map of the vegetation of the United States, Shantz and Zon (*18*) have placed the mountainous part of the county in the spruce-fir forest type (northern coniferous forest), and the northern one-third of the county in the birch-beech-maple-hemlock forest type (northern hardwood).

The present forests of Franklin County vary widely in composition because of differences in soil, elevation and associated climatic differences, forest fires, and cutting. On most of the glacial till that is medium or high in lime, the forest consists of mixed hardwood, mainly maple and beech. On the better drained sites, where the till is more acid, the forests resemble those on the high-lime glacial till, except that considerable pine is mixed with the hardwoods. Where the acid tills are poorly drained, spruce, fir, and hemlock forests are predominant, and blueberries and ferns are abundant in the ground cover. On poorly drained, high-lime areas whitecedar is common.

Gray birch thickets cover considerable areas of the broad sand plain in the northern part of the county, and there is little or no ground cover. Excellent stands of yellow birch, maple, and beech forests grow on the well-drained northern slopes of the Adirondacks at the lower elevations, but aspen covers many of the heavily cutover areas. Spruce, fir, larch, and hemlock forests are predominant on most of the poorly drained and more acid soils of the mountainous area. Small plantings of red, white, and Scotch pine are common on well-drained sandy soils throughout the county.

Many pastures and abandoned and idle fields have a shrub vegetation that is characteristic of this region. On the high-lime soils in the northwestern part of the county, scattered hawthorn bushes and thickets of prickly ash are common. Blueberry thickets are the main cover over fairly large areas of the poorly drained acid soils near the southern margin of the St. Lawrence Valley plain. Dense growths of hardhack and meadowsweet are also common in this area. Wild blackberries are common throughout the St. Lawrence Valley plain section, especially in small clearings and along the edges of woodlands. Large areas of droughty sandy soils have a sparse undercover of povertygrass, wild strawberries, and dewberries.

The native vegetation of each soil series is described briefly in the section, Descriptions of Soils.

Soil Formation and Classification

Table 10 shows the classification of the soils of Franklin County by great soil groups and soil catenas. Except for the Humic Gley and Low-Humic Gley, each of the great soil groups is described in the 1938 Yearbook of Agriculture (*22*). A description of the Humic Gley and Low-Humic Gley groups, as defined by Thorp and Smith (*21*), is given in the glossary. The factors of parent material, topography (drainage), or time have been dominant in the development of soils belonging to all of the great soil groups in the county except the soils belonging to the Podzol great soil group. For the Podzols, climate and vegetation are the factors that have most influenced development.

TABLE 10.—*Great soil groups and soil catenas*

[Great soil groups designated by (A)—Alluvial soils; (BF)—Brown Forest soils; (GBP)—Gray-Brown Podzolic soils; and (P)—Podzols. Hydromorphic associates designated by: (LHG)—Low-Humic Gley; (HG)—Humic Gley; and (HB)—Half-Bog]

Parent material	Drainage				
	Good	Moderate	Imperfect	Poor	Very poor
ALLUVIAL SOILS AND HYDROMORPHIC ASSOCIATES [1]					
Recent stream alluvium from—					
Sandstone, granite, and syenite	Ondawa (A)	Podunk (A)		Rumney (LHG)	Saco (HG).
Sandstone and limestone	Genesee (A)	Eel (A)		Wayland (LHG)	Sloan (HG).
BROWN FOREST SOILS AND HYDROMORPHIC ASSOCIATES [1]					
Glacial till, mainly from limestone	Grenville (BF)	Hogansburg (BF).		Massena (LHG)	Sun (HG).
Glacial outwash and marine beach deposits, mainly from limestone.	Kars (BF)				
GRAY-BROWN PODZOLIC SOILS AND HYDROMORPHIC ASSOCIATES [1]					
Silty lacustrine deposits and lacustrine deposits reworked by ice.			Rhinebeck (GBP)	Madalin (LHG)	Livingston (HB).
Marine clay				Covington (HG), Panton (LHG)	Livingston (HB).
Fine marine sands over marine clay.				Swanton (LHG)	
PODZOLS AND HYDROMORPHIC ASSOCIATES [1]					
Glacial till from—					
Sandstone mixed with some limestone.	Parishville (P)	Moira (P)	Brayton (P)	Massena (LHG)	Sun (HB).
Sandstone mainly	Worth (P)	Empeyville (P)	Westbury (P)	Dannemora (LHG)	Tughill (HB).
Granitic and syenitic rocks mainly	Hermon (P), Becket (P)	Skerry (P)	Skerry (P)	Ridgebury (LHG)	Whitman (HB).
Sandstone mixed with some limestone, reworked by wave action.		Fahey (P)		Coveytown (LHG)	Cook (HB).
Beach deposits mainly from sandstone, but partly from limestone.	Trout River (P)	Fahey (P)		Coveytown (LHG)	
Stratified glacial drift—					
Coarse sands and gravel	Constable (P), Colton (P)	Duane (P)		Walpole (LHG)	Scarboro (HB).
Medium and fine sands	Wallace (P), Adams (P)	Croghan (P)	Au Gres (P)	Walpole (LHG)	Scarboro (HB).
Glaciolacustrine fine sand and silt	Salmon (P)	Nicholville (P)		Wallington (LHG)	Birdsall (HG).

[1] Hydromorphic associates are Low-Humic Gley, Humic Gley, and Half-Bog soils.

Podzols

Of the seven great soil groups represented in Franklin County, only the Podzols are truly zonal in that they reflect the influence of the climate and biological zone in which they occur. All of Franklin County lies within the Podzol soil region described by Marbut (*10*). Its cool humid climate and short growing season, combined with northern hardwood or coniferous forest vegetation, are believed to be the dominant factors in the formation of Podzols (*17*).

A summary of the major processes in the development of Podzols follows: (a) Bases are leached from the exchange complex within the solum causing the soil to become strongly acid; (b) organic matter accumulates in the form of a mor horizon on the soil surface; (c) sesquioxides mobilize in the uppermost mineral horizon (A_2 or bleicherde); (d) sesquioxides move out of the A_2 horizon, probably as organic complexes; and (e) sesquioxides, especially iron, with humus accumulate in the B horizon (ortstein or orterde).

The strongest Podzol development has occurred in the Colton, Constable, Adams, and Wallace series, which developed from coarse-textured, water-sorted parent materials derived, in some places, mainly from siliceous sandstone and, in other places, mainly from granitic and anorthositic rocks.

Other Podzol soils of the county are those of the Hermon, Becket, Worth, and Parishville series. These soils have developed on sandy loam glacial till and have fragi-

pans below the Podzol profiles. The upper parts of these profiles are similar to those of the Colton, Constable, Adams, and Wallace series, but the horizons are generally thinner, and the Podzol characteristics are not so strongly expressed. The Hermon and Becket soils have developed from material derived mainly from granitic and syenitic rock; they have slightly redder B horizons than the soils in the Worth and Parishville series, which developed from material derived mainly from siliceous sandstone.

Fragipans

A fragipan is a dense layer of soil that is brittle and hard when dry and soft when wet. Fragipans have been called hardpans (*15*), siltpans (*19*), and silica hardpans (*25*), although many now prefer to reserve the term "hardpan" for a layer that does not soften if it becomes wet. Fragipans underlie the Podzol solums of almost all of the Franklin County soils that have developed on glacial till. Soils that have developed from sandy parent material have 12- to 14-inch fragipans that are firm to very firm. The siltier the parent material, the thicker and harder the fragipan.

Soils in this area that have developed on fine sandy loam till have an A_2 horizon that is generally platy and 3 to 6 inches thick. Below this is the very hard fragipan layer, 12 to 14 inches thick, where the structure is weak blocky grading toward thick platy, but in moist exposed spots the structure may not be apparent. This hard horizon is commonly underlain by an 18- to 24-inch transitional horizon that becomes less firm with depth and grades to fairly loose sandy till. The hard fragipan horizon has the highest content of clay.

In soils that have developed on loam till, the pan is more like the B horizon of a Gray-Brown Podzolic soil. The structure is fairly distinct subangular blocky to blocky, and the fragipan horizon contains considerably more clay than the A_2 horizon. This kind of fragipan horizon is of limited extent in Franklin County.

Fragipans do not occur in extremely sandy or very clayey soils. They are most highly developed in strongly acid Podzols. They occur in some soils that have developed from materials that contained moderate amounts of lime, but do not occur in Brown Forest soils that have developed from highly calcareous parent material. Gray silty material, which does not occur in the layers above the fragipan, coats the upper surfaces of rock fragments and impregnates the uppermost part of the peds within the fragipan. In the coarser textured materials, this silty material partially fills the interstices between individual grains and forms bridges that strengthen the pan formation.

Brown Forest Soils

The Brown Forest soils in Franklin County have developed on highly calcareous drift. In New York, soils of the Grenville series represent the modal Brown Forest soils as described by Cline (*4*). These soils are base saturated from the surface down and are leached of carbonates only to shallow depths. Profile development is weak; it consists principally of an A_1 horizon of humus accumulation, underlain by a brown or reddish-brown B horizon that derives its color from iron oxides, released as the parent material weathered, with humus. The content of clay and of organic matter decreases with depth, and the pH increases.

The Kars series consists of Brown Forest soils that have developed on highly calcareous coarse-textured drift. They are typically neutral throughout the solum and have weakly developed profiles. There is faint but clear evidence of silicate clay accumulation just above the calcareous C horizon. These soils resemble soils of eastern Canada that have been classified as Brown Forest-Gray-Brown Podzolic intergrades by Stobbe (*20*).

The Brown Forest—Gray Brown Podzolic—Podzol development sequence that occurs in other parts of New York (*4*), (*9*), (*12*) does not occur in Franklin County. Brown Forest soils derived from similar parent materials appear to grade directly to Podzols. The Gray-Brown Podzolic group is missing, probably because the necessary parent material is lacking.

Alluvial Soils

The alluvial soils consist of materials that have been in place only a comparatively short time. The soils have poorly defined genetic horizons, or none at all, because such horizons have not had time to develop.

Hydromorphic Soils

The hydromorphic soils of Franklin County are important because of their large area. They are classified in the Low-Humic Gley, Humic Gley, and Half-Bog great soils groups. Their predominant characteristics are associated with gleying and the accumulation of organic matter at the surface. The relationship among these groups of soils and their better drained associates has been discussed by Cline (*5*).

Soil Associations

A soil association is an area of land consisting of one or more soil types that occur in a characteristic pattern. It often consists of soils that differ drastically from one another in important characteristics. Each soil association, however, has a certain repeating pattern of the same important soil types and other features that give it a characteristic landscape.

A soil association is named for the most extensive soil or soils in the area. Sometimes a single series name is used; for example, the Rhinebeck association in Franklin County is dominated by one soil type, which is characteristically associated with relatively small acreages of certain other soils. More commonly an association will be named for two or three soil series, each of which makes up a significant proportion of the association. The Skerry-Ridgebury association is an example.

Approximate acreage and proportionate extent of the soil associations in Franklin County, both for the section mapped in detail and for the part mapped in reconnaissance, are shown in table 11.

TABLE 11.—*Approximate acreage and proportionate extent of soil associations*

PART MAPPED IN DETAIL

Map symbol	Soil association	Acres	Percent
AC	Adams-Colton	23, 100	2. 1
AW	Adams-Walpole	25, 200	2. 3
BSs	Brayton-Sun, very stony phases	2, 700	. 3
CC	Coveytown-Cook	25, 500	2. 4
DWs	Dannemora-Westbury-Tughill, very stony phases	9, 600	. 9
GH	Grenville-Hogansburg-Massena	28, 500	2. 6
HB	Hermon-Becket	2, 500	. 2
KA	Kars	900	. 1
MU	Muck	1, 500	. 1
MB	Moira-Brayton-Sun	52, 200	4. 9
ML	Madalin-Livingston	7, 200	. 7
RB	Rhinebeck	2, 100	. 2
SN	Salmon-Nicholville	6, 300	. 6
SR	Skerry-Ridgebury	7, 500	. 7
TF	Trout River-Fahey	13, 500	1. 3
WA	Walpole-Au Gres-Scarboro	25, 500	2. 3
WD	Westbury-Empeyville-Dannemora	24, 300	2. 3
WE	Worth-Empeyville	24, 600	2. 4
WEs	Worth-Empeyville, very stony phases	2, 400	. 2
CV	Covington	22, 500	2. 1
	Water	2, 400	. 2
	Total for part mapped in detail	310, 000	28. 9

PART MAPPED IN RECONNAISSANCE

AC	Adams-Colton	125, 800	11. 7
AS	Au Gres-Scarboro-Peat	40, 000	3. 7
AW	Adams-Walpole	100	(1)
HB	Hermon-Becket	357, 500	33. 2
HC	Hermon-Colton	40, 000	3. 7
MU	Muck	200	(1)
PT	Peat	24, 000	2. 2
RM	Rough Mountainous Land	120, 300	11. 2
RS	Rumney-Saco	2, 300	. 2
SA	Salmon-Adams	1, 600	. 1
SN	Salmon-Nicholville	3, 100	. 3
SR	Skerry-Ridgebury	18, 500	1. 6
	Water	35, 000	3. 2
	Total for part mapped in reconnaissance	768, 400	71. 0
	Total acreage and percent of soil associations	1, 078, 400	100. 0

[1] Less than 0.1 percent.

A map showing the soil associations recognized in Franklin County is in the envelope at the back of this report. For the northern third of the county, the map was prepared from the detailed soil survey of the agricultural section of the county. For the southern two-thirds, covering the mountainous Adirondack section, the map was prepared from the results of a reconnaissance field survey. Two of the associations—Peat and Rough Mountainous Land—occur entirely in this reconnaissance section of the county.

Each soil association shown on the map is described in the following pages. The soil series referred to in the various associations are described in the section, Descriptions of Soils. Soil properties that affect use and management are described in the section, Soil Management Groups. Peat and Rough Mountainous Land are not described in detail or included in any management group, because neither can be used for agriculture.

Adams-Colton (AC)

This association is dominated by well-drained to excessively drained strong Podzols that have developed on coarse-textured stratified glacial deposits. These outwash plains and deltas are nearly level to gently undulating, but some areas of the association are rolling or hilly and kamelike.

Adams loamy sand and Colton gravelly loamy sand are the predominant soil types in the association. They occupy slopes that range from nearly level to hilly. Croghan and Duane soils are important components in many areas; they occupy nearly level to gently undulating slopes, generally at lower elevations than the associated Adams and Colton soils. Locally differences in elevation range from 2 to 60 feet.

Lenses of very fine sand and silt, varying in thickness from a few inches to 1 or 2 feet, are common in the glacial deposit that is the parent material of these soils. In many places where the lenses occur at depths of 2 to 6 feet, Croghan and Duane soils have developed on the coarser material above the lenses. Where the fine deposits outcrop, fine sandy loam and very fine sandy loam soils of the Salmon or Nicholville series have developed. The Salmon and Nicholville soils are minor constituents of the association.

No differentiation is made between the Adams and Colton soils, or between the Croghan and Duane soils. In some areas all of these soils occur; in some, only the Adams and Croghan soils, and in others, only the Colton and Duane soils.

Other soils that occur in many places in the association are Au Gres, Walpole, Scarboro, and Peat. In the part of the county mapped by reconnaissance methods, as much as 25 percent of an area of the association may consist of Hermon and Becket soils. Areas of this association that are 400 acres or more in size have approximately the following composition: Adams and Colton, 60 to 80 percent; Croghan and Duane, 10 to 20 percent.

The soils of the Adams-Colton association are poorly suited to crops or pasture because they are droughty, strongly acid, and low in available plant nutrients. They are also susceptible to severe wind and water erosion when bare of vegetation. Therefore most areas are best used for forest. Numerous plantings of Scotch pine and red pine have been successfully established, even upon severely eroded areas. On some areas that have been severely damaged by forest fires, notably in Santa Clara and Brushton Townships, little or no natural reforestation has taken place.

In the Adirondack section of the county, areas of this soil association are important for recreational use. They provide many excellent sites for summer cottages, picnic grounds, campgrounds, and hunting lodges, especially where the soils border lakes and streams. Many of the public campsites operated by the New York State Conservation Department are located on soils of this association.

Adams-Walpole (AW)

This association consists of sandy soils that have developed on coarse-textured stratified glacial drift. Relief is gently undulating to gently rolling, and soil drainage is excessive to very poor.

The predominant soils in the association are those of the Adams and Colton catenas. The soils occur in such a pattern, however, that neither those of the Adams-Colton association nor the ones of the Walpole-Au Gres-Scarboro association can be delineated. In an area of this association, the Adams and Croghan or Colton and Duane soils occur at higher elevations than the Walpole, Scarboro, and Au Gres soils. The Adams and Colton soils are level to steep; the Croghan and Duane, level to sloping; the Au Gres, level to gently sloping; and the Walpole and Scarboro, level to nearly level.

The composition of this association is estimated to be as follows: Adams and Croghan or Colton and Duane, 30 to 70 percent; Walpole, Scarboro, and Au Gres, 30 to 70 percent.

The low water-holding capacity is an important factor that affects the use of soils in this association. The use of the Walpole and Scarboro soils is also affected by poor aeration caused by a high-water table.

Au Gres-Scarboro-Peat (AS)

This association occurs on nearly level, wet, glaciofluvial sands, or glacial outwash, in valleys in the southern part of the county. The predominant soils are the loamy sand and sand types of the imperfectly to poorly drained Au Gres and very poorly drained Scarboro series. Peat is an important constituent in most areas, and soils of the Croghan, Adams, Hermon, and Colton series are commonly included. The Scarboro soils and Peat are level. The Au Gres soils are gently undulating to nearly level and occur at a slightly higher elevation. Nicholville and Salmon soils that have fine sandy loam solums over fine sand substrata are important inclusions in a large area of this association southwest of the village of Vermontville. Locally these soils make up about 30 percent of the association.

Areas of this association have approximately the following composition: Au Gres, 30 to 60 percent; Scarboro, 20 to 50 percent; Peat, 10 to 20 percent.

At present practically all of the association is in forest.

Brayton-Sun, Very Stony Phases (BSs)

The soils of this association have developed on the very stony glacial till of the broad smooth till plain north of the Adirondack Mountains. The relief is smooth or gently undulating, and long slopes that extend northward are common. This association occurs within the larger general area occupied by the Moira-Brayton-Sun association. Areas smaller than about 1 square mile have not been delineated on the map, but are included in the Moira-Brayton-Sun association.

The predominant soils are very stony Brayton loam and Sun loam. The Sun soils occupy slight depressions or other positions in which surface water accumulates or is concentrated. The associated Brayton soils occur on the adjacent long smooth slopes. Locally the range in elevation is only a few feet and convex slopes are rare.

The most common mapping inclusions are soils of the Moira series and slightly to moderately stony Brayton and Sun soils. Moira soils occupy small convex slopes and knolls that occur in the area.

The composition of the association is approximately as follows: Brayton very stony loam, 30 to 60 percent; Sun very stony loam, 30 to 60 percent.

These soils are so stony that farm machinery cannot be used. Poor to very poor soil drainage is another important factor that affects their use. At present most of the association is in unimproved permanent pasture or woodland.

Coveytown-Cook (CC)

This association is dominated by stony poorly drained and very poorly drained soils that have developed on coarse-textured glacial till. It forms a nearly continuous belt across the county at elevations below 500 feet. Some small areas, however, occur at elevations up to 700 feet.

Stony and very stony Coveytown and Cook loamy sands are the predominant soils. Coveytown and Cook gravelly and cobbly loamy sands are important components in a few areas. Cook soils occupy small depressions and smooth nearly level slopes where surface runoff is very slow. Coveytown soils occur on long nearly level to gentle slopes and lie a few feet higher than adjacent Cook soils. Local relief generally rises less than 10 feet.

Small areas of Trout River, Fahey, Croghan, Moira, Brayton, or Muck soils are commonly included in this association. Trout River and Fahey soils generally occur on low, long, and narrow beach ridges. These ridges may be prominent on the landscape, but are too small to be shown on the soil association map.

Areas of this association that are as large as 400 acres in size have approximately the following composition: Coveytown, 30 to 60 percent; Cook, 30 to 60 percent.

About half of the association has been cleared, and most of the cleared areas are in permanent pasture. Stoniness, coarse texture, and poor to very poor soil drainage are major characteristics that affect the use of the soils.

Covington (CV)

The Covington association occupies a smooth level marine plain of gray calcareous clay. It extends in an intermittent wedge-shaped belt across the northern part of the county, beginning a short distance west of the village of Trout River and extending westward. The plain is only slightly dissected, and most of the area is poorly drained.

Poorly drained Covington silty clay loam is the predominant soil of the association. It occupies about three-fourths of the total area. Very poorly drained Livingston silty clay loam is an important constituent in most areas of the Covington association, but it is absent from some areas. The Livingston soil occupies level or slightly depressed areas, generally those farthest removed from graded roads and drainageways.

Included in the Covington association are some areas of

the Grenville-Hogansburg-Massena association that are too small to be mapped separately. These areas occupy low hills or ridges of glacial till that rise above the level marine plain.

Other soils that are included in some areas are members of the Panton, Walpole, and Swanton series.

Areas of this association that are as large as 400 acres in size have about the following composition: Covington silty clay loam, 60 to 90 percent; Livingston silty clay loam, 0 to 40 percent.

Most of this association is in farms, but the farmsteads, roads, utilities, and other facilities are generally located on adjoining areas of the Grenville-Hogansburg-Massena association. Clayey soil texture and poor to very poor soil drainage are major problems that affect the use of the soils.

Dannemora-Westbury-Tughill, Very Stony Phases (DWs)

The soils of this association occur on the broad smooth till plain within the general area occupied by the Westbury-Empeyville-Dannemora association. Only areas about 1 square mile in size, or larger, are shown on the map; the smaller areas are included in the Westbury-Empeyville-Dannemora association. The soils slope gently to the north, and local elevations generally vary less than 10 feet. The soils have developed on very stony glacial till. Soil drainage ranges from imperfect to very poor.

Very stony phases of Dannemora, Westbury, and Tughill very fine sandy loams are the predominant soils. The Tughill soils occur on nearly level or slightly depressed areas where surface water accumulates. The Westbury and Dannemora soils generally occur on long nearly level to gently sloping areas. Where the two soils are closely associated, the imperfectly drained Westbury soil occupies slightly higher, slightly better drained positions than the adjacent poorly drained Dannemora.

In many places small areas of Empeyville and Worth soils are included in this association. As a rule they occur on convex slopes that are in slightly higher positions than those of adjacent soils.

The composition of this association is approximately as follows: Dannemora very stony very fine sandy loam, 30 to 60 percent; Westbury very stony very fine sandy loam, 20 to 40 percent; Tughill very stony very fine sandy loam, 10 to 40 percent.

The predominant soils of this association are so stony that farm machinery cannot be used. About half of the association has been cleared and is in unimproved permanent pasture; the remainder is in woodland. Stoniness and poor drainage are major factors that affect the use of the soils.

Grenville-Hogansburg-Massena (GH)

The soils of this association occur in the northwestern part of the county. They occupy ridges of calcareous glacial till that rise 10 to 50 feet above the low-lying marine plain. The ridges, running roughly east to west, range from nearly level to sloping and are not dissected.

Grenville, Hogansburg, and Massena loams are the predominant soils. All contain some stones. About half are somewhat stony but can be tilled; the remainder are too stony to be cropped. Grenville and Hogansburg soils occupy most of the area of higher ridges where convex slopes are predominant.

The Massena soils comprise a minor part of the association. At lower elevations, however, where nearly level and gentle uniform slopes are common, Massena soils cover half of some areas. In such places the Massena soils generally occupy nearly level slopes or slight depressions and Grenville or Hogansburg soils occupy adjacent higher ground.

Areas of this association that are as large as 400 acres in size have approximately the following composition: Grenville and Hogansburg, 50 to 90 percent; Massena, 10 to 50 percent.

Most of this association is in farms. Most of the soils have been cleared, and about a fourth of the association is used for crops. The remainder is in permanent pasture. Stoniness and a high content of lime are important factors that affect the use of the soils. Where farm machinery can be used, Grenville and Hogansburg soils will support good stands of alfalfa. Poor soil drainage is an important factor that affects the use and management of the Massena soils.

Hermon-Becket (HB)

This association occupies areas of sloping to moderately steep relief. The soils occur on glacial till that covers the lower mountain slopes in the Adirondack section of the county. The association varies in composition. Many individual areas are large. The major soils are acid, stony, well drained to moderately well drained, and moderately coarse textured.

Hermon and Becket are the predominant soils in the association. Skerry soils are common, but they generally occur in small areas, and their total acreage makes up only a small part of the association. In some places, however, Skerry soils are as extensive as the well-drained Hermon and Becket soils. Stony sandy loam is the predominant type of the component Hermon and Becket soils. Fine sandy loam types are common, and in some places are locally predominant.

Hermon soils constitute a larger part of the association than Becket soils. Some areas are almost entirely one soil or the other; in other areas both soils are intricately associated.

In addition to the areas described above, which dominate in the association, areas of rolling or hilly relief are included. These generally occur at relatively low elevations. The glacial deposits in such areas are coarse textured and in many places partially stratified. In these areas Hermon stony or gravelly light sandy loam is the most extensive soil, but smaller areas of Colton and Duane soils are included.

Small areas of Colton, Duane, Ridgebury, and Whitman soils and small rock outcrops are commonly included in the association.

The association is composed of approximately the following soils: Hermon and Becket, 50 to 70 percent; Skerry, 20 to 45 percent.

This association is used mainly for recreational areas and for forest. Most of it is accessible only by unimproved logging roads or foot trails, and the topography is

rugged. Along the northern edge of the Adirondacks, a few farms are located on the association. Abandoned buildings and fenced areas of young second-growth forest give evidence that farms were once more numerous in the area than they are today. Most of these soils are too stony to permit the use of ordinary farm machinery.

Hermon-Colton (HC)

This association is a complex pattern of low, undulating to rolling hills of glacial till that are separated by a network of nearly level to rolling areas of glacial outwash.

Hermon and Becket stony sandy loams predominate on the areas of glacial till. On the glacial outwash areas, soils of the Adams and Colton catenas occur in varying proportions; locally, Au Gres and Scarboro soils predominate, and small areas of peat are included. In some places Colton, Adams, and Au Gres soils occur in about equal proportions. Adams and Colton soils are predominant in areas of glacial outwash where relief is rolling. On areas of level or gently undulating relief, any one of the soils in the Adams and Colton catenas may be present.

The composition of the association is as follows: Hermon and Becket, 40 to 60 percent; Adams and Colton catenas, 40 to 60 percent; Peat, 0 to 10 percent.

This association was mapped only in the southern part of the county in the Adirondack section. It is used almost exclusively to produce forest products and for recreational purposes. Many of the areas can be reached only by using trails and unimproved logging roads.

Kars (KA)

This association occurs in the northwestern part of the county. The soils have developed on beach ridges and small glacial outwash deposits that are composed of calcareous glacial drift.

The predominant soils are Kars gravelly sandy loam and Kars cobbly and stony loams. The areas of sandy loam generally occur on small, nearly level outwash deposits. The loam type has developed on gently sloping beach ridges that occur on the summits of larger ridges of glacial till. Between 80 and 100 percent of the association consists of soils of the Kars series.

Practically all of the soils in the association are cleared and in farms. About half the association is cropped, and the remainder is in permanent pasture. The well-drained, high-lime soils are well suited to the usual crops, especially to alfalfa.

Madalin-Livingston (ML)

Soils of the Madalin-Livingston association occur on the nearly level, undissected plain in the northern part of the county. The soils occur intermittently in a belt that extends in a northeast-southwest direction. They range in elevation from about 400 to 800 feet. The soils are poorly to very poorly drained. They have developed mainly on lacustrine deposits.

Madalin silt loam and Livingston stony clay loam and silty clay loam are the predominant soil types. Stony soils are common. A few areas are too stony to be cultivated. The areas are very smooth, and differences in local relief have a range of only a few feet. The Livingston soils occur on smooth or slightly depressed slopes where surface water accumulates and runoff is very slow. The Madalin soils occur on nearly level areas that are generally only 1 or 2 feet higher in elevation than the adjacent Livingston soils.

In many places Moira, Brayton, and Sun soils are included in the association. Small areas of Moira soils occur on moderately well drained low ridges or islands of till that rise above the general level of the association. Brayton and Sun soils occur on the lower slopes of the ridges and in small pockets of coarser textured material. In the western part of the county, Rhinebeck, Westbury, and Empeyville soils are also commonly included in the mapping unit. These soils occupy positions similar to those of the Moira soils.

Areas of this association that are 400 acres or more in size have approximately the following composition: Madalin, 30 to 60 percent; Livingston, 20 to 50 percent.

All of this association is in farms. About three-fourths of the Madalin soils are cropped, and about three-fourths of the Livingston soils are in permanent pasture or woodland. A neutral to slightly acid reaction, moderately fine texture, and poor to very poor drainage are important soil properties that affect the use and management of soils of this association.

Moira-Brayton-Sun (MB)

This association occurs on the broad smooth till plain north of the Adirondack Mountains. It is the largest association in a belt that extends across the county in a northeast-southwest direction just north of the Westbury-Empeyville-Dannemora association. The soils have developed on medium-textured, stony glacial till derived mainly from sandstone but containing a significant amount of limestone.

Moira, Brayton, and Sun stony loams are the predominant soils, but very stony areas of these soils are common and are important constituents of the association. Slopes in the association are nearly level to gently undulating, and the entire landscape slopes gently to the north. Local differences in relief commonly range from 5 to 15 feet.

The moderately well drained Moira soils generally occupy slightly convex swells or low knolls. The somewhat poorly drained to poorly drained Brayton soils generally occur on long uniform nearly level to gentle slopes. The very poorly drained Sun soils occupy slight depressions and other positions where surface water accumulates and runoff is very slow.

Well-drained Parishville soils occur in some areas, especially in the western part of the county. They are not an important component of the association, however. They occupy positions similar to those occupied by Moira soils. Soils of the Rhinebeck, Madalin, Coveytown, and Cook series are the soils most commonly included.

Areas of this association that are 400 acres or more in size have approximately the following composition: Moira, 30 to 50 percent; Brayton, 30 to 50 percent; Sun, 10 to 30 percent.

All of this association is in farms and most of it is cleared. Nearly three-fourths of the total area is cropped, and less than a tenth is woodland. Important factors that

affect the use and management of these soils are stoniness, the need for lime on areas of Moira soils, and restricted soil drainage in areas of Brayton and Sun soils.

Muck (MU)

This association occurs north of the Adirondack Mountains. It consists of unclassified mucks, which vary in thickness from 18 inches to over 6 feet. Moderately deep muck, 20 to 40 inches thick, is predominant in most of the delineated areas. These soils occupy depressions.

The muck consists of black to dark-brown well-decayed deposits of organic matter derived mainly from woody material. It ranges from strongly to slightly acid. The most common inclusions are Half-Bog associates of the adjacent mineral soils.

The composition of the unit is approximately as follows: Muck, 70 to 90 percent; and Half-Bog soils, 10 to 20 percent.

About half the association has been cleared and is in permanent pasture; the remainder is woodland. Little experience has been gained in Franklin County in using and managing these soils for crops. They are probably best used as woodland.

Peat (PT)

This association occurs entirely in the Adirondack Mountain section that was surveyed only by reconnaissance methods. It occupies depressions or level areas that have very poor surface drainage. It generally occurs on areas of glacial outwash.

The peat bogs consist of deposits of acid, brown, woody peat derived mainly from coniferous plants. The present vegetation on most large bogs is of a moss-shrub type. Many of the smaller bogs support a stand of black spruce, balsam fir, and tamarack. The areas range in size from 2 or 3 acres to about 600. Only the larger areas are shown on the map. In places these include small areas of Scarboro or Au Gres soils.

Rhinebeck (RB)

The Rhinebeck association is mapped in the western part of the county north of the Adirondacks. It occupies areas of nearly level to gently undulating relief at elevations between 400 and 800 feet. The dominant soils have developed on silty lacustrine deposits or on lacustrine deposits reworked by glacial ice

Somewhat poorly drained Rhinebeck silt loam, which occurs on nearly level to gently sloping relief, is the dominant soil in the association. The composition varies, however, from one area to another. In some places Madalin soils occur on nearly level to level areas that lie at slightly lower elevations than the associated Rhinebeck soil. As a rule, Moira stony loam, Empeyville stony very fine sandy loam, and Salmon and Nicholville fine sandy loams are associated with the Rhinebeck soils in other areas. Moira and Empeyville soils generally occupy slightly convex slopes of low relief. Between 50 and 80 percent of the association consists of Rhinebeck silt loam.

Practically all of this association has been cleared and is in farms. About three-fourths is cropped. Restricted soil drainage and the risk of erosion affect the use and management of the dominant soils.

Rough Mountainous Land (RM)

All of this association is in the Adirondack Mountains, in that part of the county that was surveyed only by reconnaissance methods. Most of the association occurs at elevations greater than 1,800 feet. It is characterized by steep to very steep slopes and many rock outcrops, mostly of granitic and syenitic gneisses and anorthosite. Some parts of the association are covered by glacial till; in these areas the rock outcrops are from 1 to 3 acres in size, and large boulders are common. More extensive rock outcrops occur on the mountain summits and on steep, south-facing slopes.

In the areas covered by glacial till, steep stony soils of the Hermon series dominate the association. Stony sandy loam is the most common type; stony fine sandy loam and stony gravelly loam also occur. Stoniness ranges from class 2 to class 4, but class 3 is the most common.

The Podzol A_2 horizon averages 1 to 1½ inches thick; in Hermon soils at lower elevations and on gentler slopes, this horizon is about 3 inches thick. The mantle of glacial till appears to be 3 or 4 feet thick in most places. Shallow phases of the Hermon soils do not occur extensively, and the Becket soils, which are commonly associated with the Hermon soils, are only minor components of the Rough Mountainous Land association.

The composition of the association is approximately as follows: Steep Hermon soils, 30 to 60 percent; Rock outcrops, 30 to 60 percent.

Rumney-Saco (RS)

This association occurs on the flood plains of several of the streams and rivers within the Adirondack Mountains area. The soils have developed on recent alluvium. They are poorly to very poorly drained.

Soils of the Rumney and Saco series are predominant. Some areas of marsh are included in the association, especially along the Raquette River in the vicinity of Tupper Lake. Minor inclusions consist of small areas of Muck, Au Gres, and Scarboro soils.

The composition of the association is approximately as follows: Rumney, 30 to 60 percent; Saco, 30 to 60 percent.

Poor to very poor soil drainage and frequent stream overflow limit the use of these soils.

Salmon-Adams (SA)

The only area of this association shown on the map is in the southern part of the county just south of Upper Saranac Lake. The soils have developed on glaciolacustrine fine sand, very fine sand, and coarse silt, but areas of kames and glacial till are included in the association. The relief is undulating to rolling; and the soils are predominantly well drained.

Salmon and Nicholville very fine sandy loams and fine sandy loams on undulating to gently rolling slopes are the

dominant soils. They are intricately associated with Adams loamy fine sand, which occurs on similar slopes. The texture of the lacustrine deposits varies considerably, both horizontally and vertically. Salmon or Nicholville fine sandy loam profiles, 24 to 34 inches thick, commonly overlie clean fine sand or very fine sand. In places varved very fine sand and coarse silt extend downward to 4 or 5 feet below the solum.

Colton gravelly and cobbly loamy sands and Hermon stony sandy loam occur in small areas. They generally occur at higher elevations and on steeper slopes than the Salmon, Nicholville, or Adams soils. Croghan, Wallington, and Peat soils are minor inclusions.

The composition of the association is approximately as follows: Salmon and Nicholville, 40 to 60 percent; Adams, 20 to 30 percent; Colton, 10 percent; Hermon, 10 percent.

This association is used for recreational purposes and for forest.

Salmon-Nicholville (SN)

The largest areas of this association are south of Malone, adjacent to the valley of the Salmon River, and in the southeastern part of the county in the vicinity of Gabriels and Vermontville. The soils have developed on thin deposits of fine and very fine sands, presumably of glaciolacustrine origin, that mantle the undulating to gently sloping till plain.

The dominant soils are Salmon and Nicholville fine sandy loam and very fine sandy loam types. Areas of moderately deep soils, in which glacial till occurs at depths of 20 to 36 inches, make up about half of the association. In the vicinity of Gabriels and Vermontville, the depth to glacial till is somewhat less, averaging about 18 inches. In many places the Salmon and Nicholville soils occupy similar topographic positions, but where they are intricately associated, the Salmon soils occupy the higher, more convex, and better drained slopes.

In some places Wallington soils are minor members of the association. They occupy nearly level to slightly depressed areas that have poor surface drainage. In the southeastern part of the county, small areas of Hermon soils are included in the mapping unit.

Salmon and Nicholville soils comprise from 70 to 90 percent of the areas of this association that are 400 acres or more in size.

This association is all in farms, and most of it is cropped. The soils respond well to good management. Many areas are intensively used for potatoes and other crops. The risk of erosion is greater on the Salmon and Nicholville soils than on most other soils in the county. Therefore special erosion control practices are important, especially when the soils are used for short rotations consisting largely of row crops.

Skerry-Ridgebury (SR)

The Skerry-Ridgebury association occupies smooth till-covered mountain slopes in the northern part of the Adirondacks. Slopes are less steep and local relief less variable than is typical of the Hermon-Becket association.

Stony sandy loam and stony fine sandy loam types of Skerry and Ridgebury soils are predominant. Stoniness classes 2 and 3 are the most common. The poorly drained Ridgebury soils occupy long nearly straight slopes of up to 15 percent gradient, gently concave slopes of streamheads, and other positions where surface runoff accumulates. The Skerry soils occupy slightly convex slopes of low gradient. Hermon and Becket soils commonly, but not invariably, occur on the best drained parts of the association.

Small rock outcrops, generally less than 3 acres in size, are common. They occupy only a small part of the association. Other minor inclusions are soils of the Whitman, Colton, and Duane series.

The composition of the association is estimated to be as follows: Skerry, 30 to 60 percent; Ridgebury, 20 to 50 percent; Hermon and Becket, 0 to 20 percent.

Most of this association is forested and is used to produce forest products and for recreational purposes. On the northern fringe of the Adirondacks, however, some areas have been cleared and are in farms. Stoniness, imperfect to poor soil drainage, and a comparatively short growing season are important factors that affect soil use and management.

Trout River-Fahey (TF)

This association occurs in the northern part of the county. The soils have developed on partially water-sorted, or wave-worked, glacial till on low undulating beach ridges that extend roughly in an east-west direction. The soils occur most commonly at elevations of 350 to 700 feet, but some are at elevations up to 1,000 feet. The predominant soils are coarse textured and well drained to moderately well drained. Relief ranges from nearly level to gently sloping, and local relief is generally less than 20 feet.

Trout River and Fahey gravelly or cobbly loamy sands are predominant in most areas. They occur on similar slopes, but the Fahey soils commonly occupy slightly lower positions where the water-sorted parent material is not so thick as that of the well-drained Trout River soils. Stony or very stony Fahey loamy sands are predominant in a few of the small areas shown on the map. Small areas of Coveytown, Cook, Adams, Brayton, and Moira soils are included in many places.

Areas of this association that are 400 acres or more in size have approximately the following composition: Trout River, 30 to 80 percent; Fahey, 20 to 50 percent.

Most of this soil association has been cleared, and more than half is cropped. Although the soils are coarse textured and droughty, they support a somewhat more prosperous agriculture than soils of the Adams-Colton association, probably because, being shallower over glacial till, they have a slightly higher moisture-supplying capacity.

Walpole-Au Gres-Scarboro (WA)

Most of this association occurs on the broad smooth sand plain in the north-central and northwestern parts of Franklin County. Smaller areas occur throughout the

northern third of the county, in many places on the bottomset beds of deltas. The predominant soils are sandy and somewhat poorly drained to very poorly drained. Local differences in relief are slight; they are commonly as little as 3 or 4 feet and seldom over 10 feet.

Walpole loamy sand, Au Gres loamy sand, and Scarboro loam are the dominant soils. Relief is nearly level to gently undulating. Walpole and Scarboro soils occupy nearly level areas, and Au Gres soils occur on the broad rises of slightly higher ground. Croghan and Adams loamy sands generally occur in the association and occupy as much as 30 percent of some areas. They occur on areas of undulating relief or on ridges that rise to elevations of 5 to 15 feet above the less well drained soils that they adjoin. In the northwestern part of the county, neutral variants of the Walpole and Scarboro soils are more common than the normal acid profiles.

The soil pattern varies from a complex one, made up of 2- to 4-acre areas of individual soils, to a simple pattern in which the soils occur in comparatively large areas.

In the extreme northwestern part of the county, several large areas of Swanton fine sandy loam, neutral variant, are included in the association. Except for the included areas of Swanton soil, areas of the association 400 acres or more in size have approximately the following composition: Walpole and Scarboro, 30 to 60 percent; Au Gres, 30 to 50 percent; Croghan and Adams, 10 to 30 percent.

About three-fourths of the association is woodland, most of which is in several large tracts in the northwestern part of the county. Several thousand acres are cropped. Sandy texture and generally poor soil drainage are important factors that affect the use and management of the soils.

Westbury-Empeyville-Dannemora (WD)

This association occurs on the broad smooth till plain just north of the Adirondack Mountains. It is the most extensive association in a belt 2 to 6 miles wide that extends across the county in a northeast-southwest direction. The soils have developed on stony, medium-textured glacial till derived mainly from sandstone. Relief is nearly level to gently undulating, and the entire landscape slopes gently to the north.

Westbury, Empeyville, and Dannemora stony very fine sandy loams are predominant, but very stony soils of these series are also important in the association. The Empeyville soils occur on slightly convex or nearly level uniform slopes that receive little runoff from higher ground. The poorly drained Dannemora soils occupy long, uniform, gentle or nearly level slopes, and receive considerable runoff from higher ground. The somewhat poorly drained Westbury soils occupy positions that are intermediate in character between those typical of the Empeyville and those typical of the Dannemora soils.

Worth and Tughill soils are minor constituents of the association and do not occur at all in some of the small areas. The very poorly drained Tughill soils occupy slight depressions or other areas where surface water accumulates. The well-drained Worth soils occupy positions similar to those described above for Empeyville. In the western part of the county, small areas of Salmon, Nicholville, and Rhinebeck soils are included in the association.

Areas of the association, 400 acres or more in size, have approximately the following composition: Westbury, 30 to 50 percent; Empeyville, 20 to 40 percent; Dannemora, 20 to 30 percent.

Most of this association has been cleared, and almost all of it is in farms. More than half is cropped. Stoniness, natural soil acidity, and restricted soil drainage are important factors that affect the use and management of these soils.

Worth-Empeyville (WE)

The Worth-Empeyville association occupies undulating to rolling areas immediately north of the Adirondacks. The soils have developed on stony medium-textured glacial till derived mainly from sandstone. Soil drainage is good to moderately good.

The dominant soils are Worth stony fine sandy loam and Empeyville stony very fine sandy loam. They occupy gently sloping to strongly sloping convex positions. This association generally includes very stony Worth and Empeyville soils and soils of the Westbury and Dannemora series. It varies from one area to another, however, in the proportion of the soils. The Westbury and Dannemora soils in the association generally occur in slight swales or drainageways.

Areas of the association, 400 acres or more in size, have approximately the following composition: Worth stony fine sandy loam, 30 to 50 percent; Empeyville stony very fine sandy loam, 30 to 50 percent.

Almost all of this association is in farms, and about half is cropped. Stoniness, naturally strong acidity, and comparatively good soil drainage are important factors that affect the soil use and management.

Worth-Empeyville, Very Stony Phases (WEs)

This association occurs on areas of undulating to rolling relief immediately north of the Adirondack Mountains. Except that the principal soils are very stony, the association closely resembles the Worth-Empeyville association.

Worth very stony fine sandy loam and Empeyville very stony very fine sandy loam are the dominant soils. Stony areas of these soils and of soils of the Westbury and Dannemora series are generally included, but the proportion varies from one area to another.

Areas of the association, 400 acres or more in size, have approximately the following composition: Worth very stony fine sandy loam, 30 to 50 percent; Empeyville very stony very fine sandy loam, 30 to 50 percent.

Although most of this association is in farms, little of it is used for crops because the dominant soils are so stony that farm machinery cannot be used. Most of the association is in unimproved permanent pasture. Stoniness is the principal factor that affects the use of the soils, but comparatively good soil drainage, naturally strong acidity, and medium moisture-supplying capacity are important soil properties that may affect uses other than the use for crops.

Glossary

Aggregate, soil.—A single mass or cluster consisting of many primary soil particles held together, such as a prism, crumb, or granule.

Alluvium.—Soil or rock material, such as gravel, sand, silt, or clay, deposited by a stream of water.

Anorthosite.—A granular igneous rock composed almost entirely of a soda-lime feldspar, which is generally labradorite.

Association, soil.—An area of land composed of one or more soil types that occur in a characteristic pattern. The association may consist of soils that are similar or that differ widely in important characteristics. Each soil association, however, has a certain repeating pattern of the same important soil type or types and other features that give it a characteristic landscape.

Azonal soils.—Any group of soils that lack well-developed profile characteristics because of their youth, or because relief or the type of parent material has prevented the normal soil profile from developing.

Beach ridges.—Low ridges of sorted material, often gravelly, cobbly, or stony, which mark the shore lines of old levels of the sea or lakes.

Beach terraces.—*See* Beach ridges.

Bottomset.—*See* Foreset slopes.

Brown Forest soils.—An intrazonal group of slightly acid soils that have very dark brown surface horizons. The soils are rich in humus, which grades through lighter colored soil into the parent material. In these soils little or no illuviation of iron and alumina has occurred, and there is a moderately high content of calcium in the soil colloids. Brown Forest soils have developed under deciduous forest in temperate humid regions and from parent material comparatively free of bases.

Calcareous soil.—Soil that contains enough calcium carbonate (often with magnesium carbonate) to form bubbles that are visible to the naked eye when treated with dilute hydrochloric acid. Soil that is alkaline in reaction because of the presence of free calcium carbonate.

Catena, soil.—A group of soils within one zonal area, developed from similar parent material, but differing in profile characteristics because of differences in relief or drainage.

Channery soils.—Soils that contain thin, flat fragments of sandstone, limestone, or schist up to 6 inches along the longer axis. A single piece is called a fragment.

Chroma.—The relative purity, or strength, of the spectral color. This increases with decreasing grayness. (Sometimes called saturation.)

Complex, soil.—A soil association composed of such an intricate mixture of areas of soil series, types, or phases that the areas cannot be indicated separately on maps of the scale used and are therefore mapped as a unit.

Consistence.—The feel of the soil and the ease with which a lump is crushed by the fingers. Terms commonly used to describe consistence are as follows:

Loose.—Noncoherent.

Friable.—When moist, crushes easily under moderate pressure between thumb and forefinger, and coheres when pressed together.

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 cohesive; wire formable.

Sticky.—When wet, adheres to other material; usually very cohesive when dry.

Hard.—When dry, moderately resistant to pressure; barely breakable between thumb and forefinger.

Cemented—Hard and brittle, and little affected by moistening.

Consolidated rock.—Rock made solid by the effect of pressure, chemical action, or crystallization, from a previous fluid or loosely aggregated condition.

Crystalline rock.—A general term, which includes both igneous and metamorphic rocks, used for rocks composed of crystals or parts of crystals.

Delta.—An alluvial deposit, usually more or less triangular, at the mouth of a river.

Diabase.—A basic igneous rock that generally occurs in dikes or intrusive sheets. It is composed essentially of plagioclase feldspar and augite with small quantities of magnetite and apatite.

Esker.—A narrow ridge or mound of gravelly and sandy drift deposited by a subglacial stream.

Feldspars.—A group of common rock-forming minerals that consist of aluminum silicate with potassium, sodium, calcium, or all of these, or in some places, barium. Members of the feldspar family constitute much the largest portion of the igneous rocks.

First bottoms.—The normal flood plain of a stream, part of which may be flooded only at infrequent intervals.

Flaggy soils.—Soils that contain comparatively thin fragments, 6 to 15 inches long, of sandstone, limestone, slate, or shale or rarely, of schist. A single piece is a flagstone.

Flood plain.—The nearly level areas, subject to overflow, that occur along stream courses.

Foreset slopes.—The inclined layers in a delta, composed of sedimentary material that, after being rolled along the bottom, has been dumped on the frontal slope. Foreset beds cover previously deposited bottomset beds and are covered in turn by topset beds.

Fragipan.—Compact horizons, rich in silt, sand, or both, and generally low in clay. They occur in many gently sloping or nearly level soils in humid, warm-temperate climates. The fragipan commonly interferes with root penetration. When dry, the compact material appears to be indurated, but the apparent induration disappears when the soil is moistened. Fragipans occur in soils developed from either residual or transported parent materials.

Gabbro.—A more or less dark-colored granular, igneous rock comprised mainly of basic plagioclase, generally labradorite, with a ferromagnesian mineral (augite, hypersthene, or hornblende) and accessory iron ore.

Glacial deposits.—Unstratified, or in some places roughly stratified, masses of sand, gravel, clay, and boulders that have been transported by glaciers.

Glacial drift.—The material picked up, mixed, disintegrated, transported, and deposited through the action of glacial ice or the action of water melted from the glacial ice. In many places the glacial drift is covered by loess.

Glacial lake.—A lake whose basin was formed by the action of glaciers. A water body held up by the damming action of a glacier.

Glacial outwash.—*See* Outwash, glacial.

Glacial till.—Material picked up, mixed, disintegrated, transported, and deposited through action of glacial ice, with little or no transportation by water.

Glaciofluvial deposits.—The materials produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice.

Glaciolacustrine materials.—Deposits that range from fine clays to sand, They were derived from glaciers and were reworked and laid down in glacial lakes. Many are interbedded or laminated.

Gleization.—The process of soil formation leading to the development, under the influence of excessive moisture, of a gley horizon in the lower part of the solum. A soil horizon in which the material ordinarily is bluish gray or olive gray, more or less sticky, compact, and in many places structureless, is called a gley horizon and has developed under the influence of excessive moistening.

Gneiss.—A crystalline rock in which the component minerals are arranged in parallel bands or layers. This rock tends to cleave into slabs.

Granite.—A light-colored (acid) igneous rock, coarse grained, composed mainly of quartz and feldspar with some other minerals.

Half-Bog soils.—An intrazonal group of soils that have a mucky or peaty surface soil underlain by gray mineral soil. They have developed largely under swamp-forest types of vegetation, mainly in a humid or subhumid climate.

Horizon, soil.—A layer of soil, approximately parallel to the soil surface, with characteristics produced by soil-forming processes. Horizons are identified by letters of the alphabet.

Horizon A.—The horizon at the surface. From this horizon the soluble minerals and clay have been removed by percolating water. The major A horizon may be subdivided into A_1, the part that is dark colored because of organic matter, and A_2, the part that is leached and light colored. In woodlands, a layer of organic matter accumulates on top of the mineral soil; this layer is called the A_0 horizon. Depth of soil is measured from the top of the mineral soil, because the A_0 horizon is rapidly destroyed if fire occurs or if the soil is cultivated. The A_1 horizon is missing in many of the Franklin County soils.

Horizon B.—The horizon in which clay or other material has accumulated. It may be subdivided into B_1, B_2, or B_3 horizons; layers that contain iron are marked by a symbol such as B_{2ir}, and layers that contain humus, by a symbol such as B_{2h}.

Horizon C.—The material immediately under the true soil. It is presumed to be similar in chemical, physical, and mineral composition to the material from which at least a part of the overlying solum has developed.

Gleyed Horizon.—(Pronounced glade). A strongly mottled or gray horizon that occurs in wet soils. It is designated by the letters BG, CG, or sometimes merely by G.

Humic Gley soils.—An intrazonal group of poorly to very poorly drained hydromorphic soils that have dark-colored organic-mineral horizons of moderate thickness, underlain by mineral gley horizons. The Humic Gley soils have developed under either swamp-forest or herbaceous marsh vegetation, mostly in humid or subhumid climates. Most of the soils range from medium acid to mildly alkaline; few are strongly acid.

Hydromorphic soil.—Any intrazonal soil that occupies nearly level or depressed lowlands. These areas have very slow runoff, all or part of the time, and no natural erosion. Such soils retain all, or nearly all, of the water that falls as rain and, in addition, often receive a considerable amount of runoff from adjacent uplands.

Igneous rock.—A rock produced through the cooling of melted mineral materials.

Inclusions.—Areas of soil mapped with a soil of a different type because they were too small to be mapped separately on a map of the scale used.

Intrazonal soil.—Any of the great groups of soils that have more or less well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of the climate and vegetation.

Kame.—A short irregular ridge, hill, or hillock of stratified glacial drift. Most kames are hilly and are interspersed with depressions, sometimes called "kettles," that have no surface drainage.

Labradorite.—A feldspar that consists of about equal mixtures of albite (soda-feldspar) and anorthosite (lime-feldspar). Named for the coast of Labrador where it occurs in large crystals that often show a play of colors.

Lacustrine.—Deposited by lake water.

Low-Humic Gley soils.—An intrazonal group of imperfectly to poorly drained soils that have very thin surface horizons, moderately high in organic matter. The surface layer overlies mottled gray and brown gleylike mineral horizons in which there is a low degree of textural differentiation. The soils range in texture from sand to clay. They occur largely under a natural cover of swamp forest, and in some areas of marsh grass. Most of them range from medium to very strongly acid, and few are neutral or alkaline.

Mapping unit, soil.—An area of soil enclosed by a boundary and identified by a symbol on the soil map. In the part of Franklin County that was surveyed in detail, most mapping units are phases of soil types; some are undifferentiated groups of two or more soils that are so much alike that there is no practical advantage in mapping them separately. The mapping units used in the part of the county that was surveyed by reconnaissance methods are associations of different soils.

Marine clay.—Clay deposited in the sea.

Massive.—Large uniform masses of cohesive soil, sometimes with ill-defined and irregular cleavage, as in some of the fine-textured alluvial soils; structureless.

Metamorphic rock.—A rock that has undergone pronounced alteration. Such alteration has generally been brought about by the combined action of pressure, heat, and water; frequently the rock resulting is more compact and more highly crystalline than the original. Gneiss, schist, and marble are common examples.

Mor.—A forest humus layer that consists of unincorporated organic matter that rests, with little or no mixing, on the underlying horizon.

Moraine, end.—A ridgelike accumulation of drift deposited at, or near, the relatively stationary edge of a glacier or ice sheet.

Mottling, soil.—Contrasting color patches that vary in number and size. Descriptive terms are as follows: Contrast—*faint, distinct,* and *prominent*; abundance—*few, common,* and *many*; and size—*fine, medium,* and *coarse.* The size measurements are the following; *fine,* commonly less than 5 mm. (about 0.2 in.) in diameter along the greatest dimension; *medium,* commonly ranging from 5 to 15 mm. (about 0.2 to 0.6 in.) in diameter along the greatest dimension; and *coarse,* commonly more than 15 mm. (about 0.6 in.) in diameter along the greatest dimension.

Munsell color notation.—A method of designating soil color by a combination of letters and numbers, such as 5YR 3/4. Use of the Munsell notation is explained in the Soil Survey Manual (*23*).

Orterde.—*See* Ortstein.

Ortstein.—Hard, irregularly cemented, dark-yellow to nearly black sandy material formed by soil-forming processes in the lower part of the solum. Similar material, not firmly cemented, is known as orterde.

Outwash, glacial.—A broad term that includes all of the material swept out, sorted, and deposited beyond the glacial ice front by streams of melt water. Commonly this outwash exists in the form of plains, valley trains, or deltas in old glacial lakes. The valley trains of outwash may extend far beyond the farthest advance of the ice.

Outwash plain.—A level area covered by material swept out, sorted, and deposited beyond the glacial ice front by streams of melt water.

Pedology.—The branch of soil science that deals with the morphology, genesis, and classification of soils.

Permeability.—That quality of the soil that enables it to transmit water or air.

Phase, soil.—A subdivision of a soil type, other than one based on kind, thickness, and arrangement of layers. Steepness or character of slope, number of rock outcrops, degree of erosion, depth of soil over the substratum, and natural drainage, are all examples of characteristics that suggest dividing a soil type into phases.

Podzol soils.—A zonal group of soils that have an organic mat and a very thin organic-mineral layer above a gray leached layer. The gray leached layer rests upon an illuvial dark-brown horizon. Podzols have developed under coniferous or mixed forest, or under heath vegetation, in a temperate to cold moist climate. Iron oxide, alumina, and sometimes organic matter have been removed from the A horizon of these soils and deposited in the B horizon.

Profile, soil.—A vertical section of the soil through all its horizons and extending into the parent material.

Proglacial lake.—A lake formed as the result of the melting of glaciers. As the glacial ice melted, it disappeared first from the highest areas, leaving a bare spot that slowly became larger. Drainage was mainly radial, so that each outflowing stream was ponded and became an ice-dammed lake with constantly changing outline, area, and altitude. As the barrier receded, lower outlets were uncovered, and the lakes emerged.

Quartz.—Crystallized silicon dioxide, commonly colorless, or transparent, although some varieties, such as amethyst quartz, have color. Ordinary sand is mostly quartz.

Quartzites.—Metamorphosed sandstones that differ from sandstones principally in their greater hardness, and to a certain extent, in their somewhat pronounced crystalline character.

Reaction, soil.—The degree of acidity or alkalinity of the soil mass, expressed in pH values or in words, as follows (*23*):

	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.

Schist.—Any rock that splits or cleaves readily; specifically, a rock that has a parallel or foliated structure secondarily developed in it by shearing, a process generally accompanied by more or less recrystallization of the constituent minerals in layers parallel to the cleavage.

Sedimentary rock.—A rock composed of particles deposited from suspension in water. Although there are many intermediate types, the principal groups of sedimentary rocks are (1) conglomerates (from gravels), (2) sandstones (from sands), (3) shales (from clays), and (4) limestones (from calcium carbonate deposits).

Series, soil.—A group of soils that have genetic horizons similar, except for the texture of the surface soil, as to differentiating characteristics and arrangement in the soil profile, and developed from a particular type of parent material. A series may include two or more soil types that differ from one another in the texture of the surface soil.

Sesquioxide.—A binary compound of oxygen and a metal in the proportion of three to two.

Soil.—The natural medium for the growth of land plants on the surface of the earth; composed of organic and mineral materials.

Solum.—The upper part of the soil profile above the parent material. In this part of the profile, the processes of soil formation take place.

Structure, soil.—The arrangement of the soil particles into lumps, granules, or other aggregates. Structure is described by grade (weak, moderate, or strong), that is, the distinctness and durability of the aggregates; by the size of the aggregates (very fine, fine, medium, coarse, or very coarse); and their shape (platy, prismatic, columnar, blocky, granular, or crumb). A soil is described as structureless if there are no observable aggregates. Structureless soils may be massive (coherent) or single grain (noncoherent).

Blocky, angular.—Aggregates are block shaped; they may have flat or rounded surfaces, that join at sharp angles.

Blocky, subangular.—Aggregates have some rounded and some plane surfaces; vertices are rounded.

Columnar.—Aggregates are prismatic and are rounded at the upper ends.

Crumb.—Generally soft, small, porous aggregates, irregular, but tending toward a spherical shape, as in the A_1 horizons of many soils. Crumb structure is closely related to granular structure.

Granular.—Roughly spherical, firm small aggregates that may be either hard or soft, but are generally more firm than crumb and without the distinct faces of blocky structure.

Platy.—Soil particles are arranged around a plane, usually horizontal.

Prismatic.—Soil particles are arranged around a vertical line; aggregates have flat vertical surfaces.

Syenite.—A coarse-grained light-colored rock that contains little or no quartz.

Texture, soil.—Size of the individual particles making up the soil mass. The relative amounts of particles of different size classes, called sand, silt, and clay, determine texture. A coarse-textured soil is one high in content of sand; a fine-textured one contains a large proportion of clay. Common soil textures in Franklin County are loamy sand, sand, loam, silt loam, and clay. The loamy sand contains mostly sand with only a small proportion of fine material. Clay contains enough fine material to make it plastic and sticky when wet. The other textural classes lie between these extremes.

Clay.—Small mineral soil grains, less than 0.002 mm. (0.000079 in.) in diameter. Clay soils do not have definite structure and are usually described as massive.

Silt.—Small mineral soil grains ranging from 0.05 mm. (0.002 in.) to 0.002 mm. (0.000079 in.) in diameter. Includes all soil material that contains 80 percent or more silt and less than 12 percent clay.

Sand.—Small rock or mineral fragments that have diameters ranging from 0.05 mm. (0.002 in.) to 2.0 mm. (0.079). The term sand is also applied to soils that contain 90 percent or more of sand.

Type, soil.—A group of soils that have genetic horizons similar as to differentiating characteristics, including texture and arrangement of the soil profile, and developed from a particular type of parent material.

Topsoil (engineering application).—Soil material containing organic matter and suitable as a surfacing for shoulders and slopes,

Varves.—Distinctly marked annual deposits of sediment, regardless of its origin, that usually consists of two, but may consist of more than two, layers.

Wave-worked till.—Glacial till washed by lakes, but without important additions. The upper part of the wave-washed till has more than the usual amount of coarse fragments as a result of the wave action in glacial lakes.

Zonal soil.—Any one of the great groups of soil that have well-developed soil characteristics reflecting the influence of the active factors of soil genesis—climate and living organisms, chiefly vegetation.

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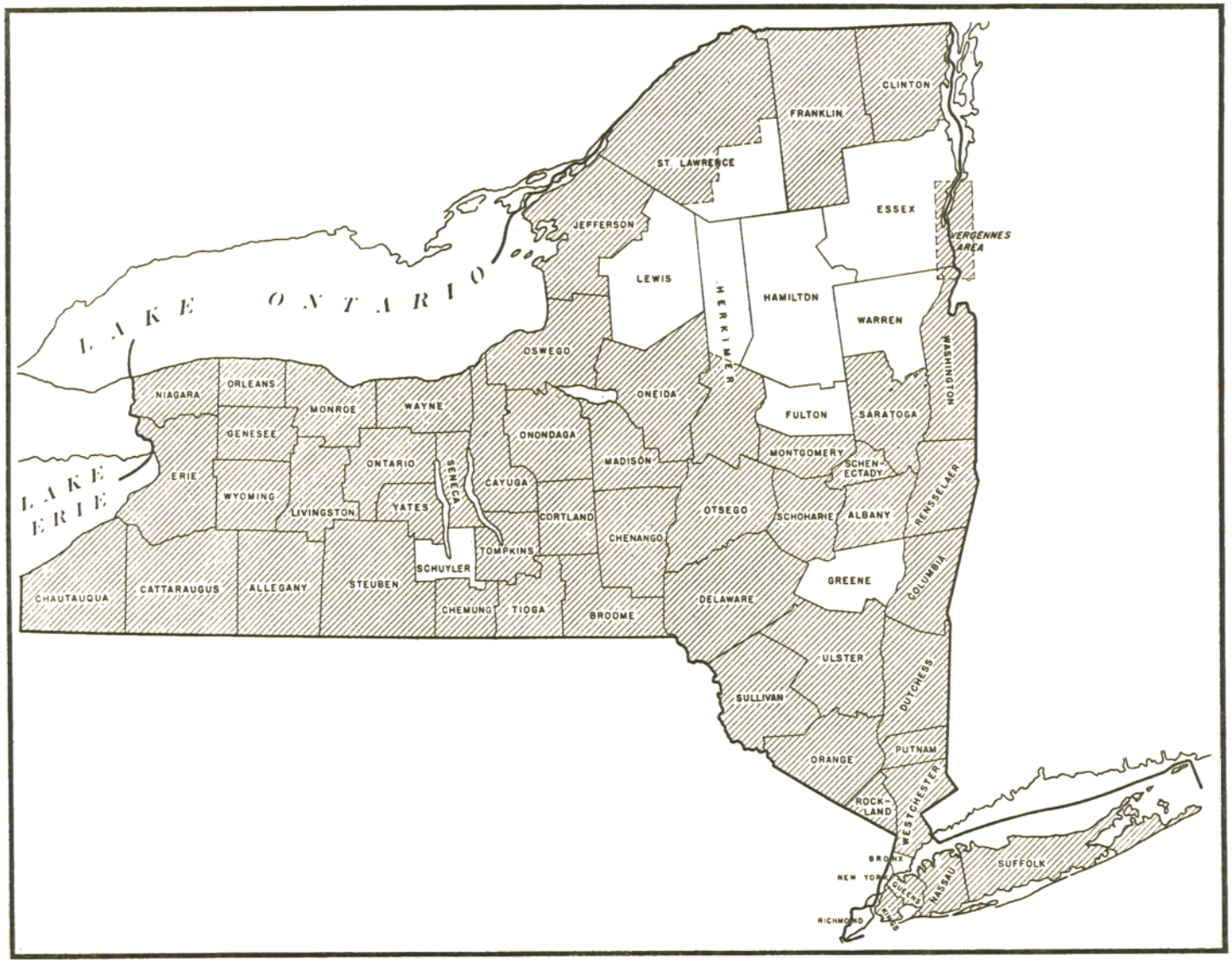

Areas surveyed in New York shown by shading.

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